Issue 7 March 2016

pyrotechnic MAGAZINE

FOR FIREWORK COMPANIES & ENTHUSIASTS ACROSS THE WORLD

London calling

by Darryl Fleming

For 2016 the Mayor of London's New Year's Eve Firework display was for the first time partnered with Unicef, providing a spectacular pyromusical display from the Coca Cola London Eye.

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Professional Artistic Solutions

by Salvatore Bonfiglio

Piroshow has been designed to provide pyrotechnic companies with a complete and articulated system of products that can help compensate for any need that may arise during design, installation, grounding and/or execution of any type of fireworks.

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Selling Consumer Fireworks in the Netherlands

Since the Seventies, New Year's Eve has been a very big celebration in the Netherlands. In The Netherlands, people aged sixteen or older are allowed to buy consumer fireworks.

The history of Knokke-Heist

Jack Suijkerbuijk looks at The Knokke-Heist fireworks festival which is held on a Belgian beach is one of the oldest fireworks festivals anywhere in the world.

Sicily & Pyro

Tobias Brevé & Robin Harteveld annual fireworks road trip began last summer on the beautiful Italian island of Sicily. Just as in the summer of 2014 they were fortunate enough to see some outstanding Sicilian displays.

Welcome

Because Tony Gemmink (our publisher) made it to this year's International Symposium on Fireworks (ISF) in Bordeaux, and I'm going to the PGI in La Porte, Indiana this coming August, we appear to have sorely neglected the American Pyrotechnics Association (APA). Just as we're finishing up this issue, the APA www.americanpyro.com held its winter educational conference at Caesar's Palace in Las Vegas (I know, rough, huh?). Anyway, the APA is a great organization and they literally do everything imaginable to insure their members are well trained and well prepared for every upcoming fireworks season. In particular, this includes training APA members about the latest (and often very confusing) federal regulations regarding fireworks. In addition to this, the APA encourages safety in the design and use of all types of fireworks everywhere. I know John Sagaria attended this year, and I'm sure a great many other pyrotechnic people who read our magazine attended, too, so if any of you would like to fill us in on what went on during this year's conference, we'd be glad to include your report in our next issue.

Also included in this issue is an interview with artist Rosemarie Fiore. I interviewed her once a long time ago for an issue of '76 Pyro Magazine (a magazine some of you may remember that was published by Spirit of '76 Fireworks in Columbia, Missouri). You know, I even love this woman's name: "Rosemarie Fiore." It has an almost Italian resonance when you say it (you have to mover your hands at the same time). And if you haven't seen her artwork—created via pyrotechnic smoke and combustion—then you're in for a real treat. Rosemarie is a true artistic spirit, and she creates some of the coolest artwork using fireworks that I've ever seen (although David Sena is still a favorite of mine as well). Be sure to check her out in this issue and visit her site, too (the links are in the article).

If you're looking for a festival to attend this Christmas, and you want to make it undeniably memorable, then be sure to read Christophe Blanc's account of Christmas in Giouvieux, France. Located in the Chantilly metropolitan area just outside of Paris, I think Christophe may have stumbled upon an actual Christmas wonderland. (Honestly, what could be better than Christmas

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Fallas de Valencia 2016

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Rosemarie Fiore

in Paris!). And if you want to follow that up with an incredible New Year's Eve experience, then how about New Year's in London, smack dab in front of the London Eye! That may truly be the ultimate pyrotechnic experience. Julien Batard did just that and he shares his wonderful photography with us as he makes every photographer out there envious of his prime location in front of Europe's largest Ferris wheel on New Year's. Just imagine having a front row seat to watch 400 different types of fireworks create 10,000 explosions on the Eye, three barges and 14 pontoons!).

In addition, we have an informative history of the Knokke-Heist fireworks festival held annually on a beautiful Belgian beach. This is something that began modestly back in 1969 and grew in preeminence and popularity. We also have part 1 of a Sicilian trip taken by Tobias Brevé & Robin Harteveld to see fireworks in southern Italy. Their trips are always fun and fascinating, and this trip to Villafranca Sicula is no exception. They share a lot of interesting footage with us in their article, so be sure to watch the videos!

And if that weren't enough, we have also included some technical articles for the equipment junkies out there explaining "Piroshow: Professional Artistic Solutions," and an in-depth look at adjustable bombettes called "BlackBoxx BULLETS." Then we have somewhat of a preview of Fallas de Valencia 2016 as we take an inside look at the Pirotecnia Europla and Pirotecnia Hermanos Caballer factory in Valencia as they prepare for this year's Fallas event. As you'll see, they produce a large amount of very high quality fireworks with CE markings and have the fireworks for Fallas already made, stored in bunkers and ready to go.

So, another astounding assemblage of fireworks articles, photography and video. You know, it never ceases to amaze me about how much is actually going on in the fireworks world during any given month. Why the mainstream media doesn't carry more about it also astonishes me. Oh they'll carry an accident if and when they happen, but they truly fail our industry when it comes to paying homage to the technical skill necessary to design miraculous pyromusicals (it still irks me that the word "pyromusical" isn't in most dictionaries) or the true beauty of fireworks lighting up the daytime or nighttime skies. THAT is why a publication like Pyrotechnic Magazine is so important. Don't just read what's here, though, but try to contribute as well. It is the only way this art form will survive.

Michael Richards
Editor, Pyrotechnic Magazine

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If you have an ideas for an article, have any interesting fireworks photograph or have written an article that you would like to see in an upcoming issue of our magazine, please e-mail tony@pyrotechnicmagazine.com

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Consumer rks in the therlands

Written by Robin Harteveld & Tobias Brevé

Since the Seventies, New Year's Eve has been a very big celebration in the Netherlands. As we explained in a previous issue of Pyrotechnic Magazine, in The Netherlands, people aged sixteen or older are allowed to buy consumer fireworks. Not that there hasn't been a great deal of speculation about the future of consumer fireworks here in the Netherlands, but in spite of the dismal prophesies, nationally, fireworks sales—especially of the most beautiful consumer fireworks—are up substantially.

There are many people who buy only a few cakes or fountains to celebrate the start of the New Year. On the other hand there are an equally large number of Netherlanders who love fireworks and spend a lot of money on them. The rules are very strict here, however, regarding when you can set off fireworks and people are only allowed to shoot fireworks between 6:00 PM and 2:00 AM (December 31st-January 1st). Because of this, people want to make certain they get the most enjoyment out of the short time frame allowed. Some people set off fireworks all evening, while others create wonderful shows for their entire neighborhood. Since Dutch consumer →

Selling Consumer Fireworks in the Netherlands

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fireworks are generally high quality products, and since there is a wide variety of merchandise to choose from, midnight on New Year's Eve in The Netherlands is almost guaranteed to be quite a spectacle.

Despite the short time frame to set off fireworks, people here are allowed to pick up fireworks they've ordered in advance, or buy additional fireworks during the last three days of December. Actually, people can preorder fireworks all year round, depending on the store. Most firework stores open their Internet shops around the beginning of December and price products competitively. Six years ago, Robin began working in consumer fireworks sales for Intratuin Pijnacker. Normally, throughout the year, Intratuin Pijnacker is simply a large garden center, but they branched out into fireworks sales and hired Robin to advise them as well as help consumers with individual fireworks purchases. This might be as simple as helping someone buy a small package of fountains, to directing others about which fireworks cakes are the best to buy. Two years ago, Robin's role and responsibilities became much more intensive, and I also joined Intratuin Pijnacker to help with fireworks sales.

What we've found is that selling fireworks is often quite challenging. Just delivering all the different products to our customers on time within such a short time frame can be difficult—especially with all of the regulations involved. And if we want our customers to return the following year, we need to make certain their sales experience is a good one.

Regarding regulations, the list in The Netherlands seems almost endless. Ever since the Enschede fireworks disaster that happened May 13th 2000, which killed 23 people and injured over 900 others, the regulations have been sharpened and expanded. Stores have stringent requirements that must be followed fastidiously and each store must be licensed. For example, stores here that sell fireworks must have qualified bunkers. In fact, many fireworks stores here own more than one bunker: one for storage, and another for customers to pick up their orders. These bunkers require an elaborate sprinkler system and a license stating how many kilos of fireworks they are allowed to have within their bunker at any given time (e.g., these amounts range from10,000 to 40,000 kilos/22,000 lbs. to 88,000 lbs.). Because of this capacity constraint, it is rarely possible to have all the required fireworks product delivered all at one time. Trucks working for import companies oftentimes drive around The Netherlands from border to border for three days to make sure fireworks stores have enough product in stock. Overall, this system works very well, but it requires careful advanced planning from each store.

Planning is critically important so that every customer who preordered product will have it waiting at a specific time for pickup (e.g., December 30th between 1:00 PM and 1:30 PM). To satisfy our customer base, all preordered items need to be in stock and ready for pickup at the allotted time. That's often difficult when you've been selling fireworks for several days in a row, so running out of stock is always a possibility. Having trucks carrying product available several times a day helps keep most product in stock. Since most delivery times are decided in advance (mostly in November), the challenge is to accurately forecast what your sales needs might be during the last 3 days of December.

What we've found is that selling fireworks is often quite challenging. Just delivering all the different products to our customers on time within such a short time frame can be difficult—especially with all of the regulations involved.

As you may have noticed, firework stores here must earn the bulk of their income in just three days. And there is a great deal of fireworks marketplace competition in The Netherlands. In most urban areas there are an overabundance of fireworks stores. In Pijnacker, that number has reached excessive: there are at least six other fireworks stores located in just one neighborhood. So, the key to success is preparation and marketing. Digital marketing via Facebook has become hot recently, but old-fashioned paper flyers sent out in mailboxes are still equally important. People use these advertising flyers to easily compare prices on different products from different vendors. Online sales have become much more important as well. Most customers preorder their fireworks from online stores because they enjoy viewing videos of the fireworks then intend to order. Online stores also make sales more enticing by offering free products to customers who order prior to December 29th.

At Intratuin Pijnacker we're busy all year round preparing for December 31st. In January we start all over again with an evaluation, brainstorming about improvement we can make

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Selling Consumer Fireworks in the Netherlands

for the upcoming season and discussing how we can attract more customers this year. It is during the summer months that our final decisions are made, and then in September, the fireworks buying season begins anew. By the beginning of November we will have already set up the fireworks shop inside the garden center. This gives us a huge competitive advantage over our competition because a lot of people visit our store during the Christmas show at the Intratuin Pijnacker, so many people have the opportunity to see the fireworks we have to offer very early in the season. It is in November that we set fixed dates for deliveries and forecast of our sales needs. We also have software up and running that helps us keep our stock numbers up-to-date and better able to fulfill our online orders. In November we also increase our marketing presence by using social media, online advertising and newspaper advertisements. By the beginning of December our bunkers are filled with enough product to make our first deliveries, and we make certain all products in the bunkers are numbered and in order. Time really flies in December and before we know it, it's already Christmas time and the most important three days of our firework year are about to begin.

By the beginning of December our bunkers are filled with enough product to make our first deliveries, and we make certain all products in the bunkers are numbered and in order.

Many of our employees have fixed roles throughout the sales period, and we hire students (who ordinarily work in the garden center) to help on the weekends. Our sales team exists of four people, including myself and we work fulltime the final three days of December. It's the sales team that "makes it happen" and convinces our many customers to buy the beautiful fireworks we sell. With it being so busy and exciting at the store, the sales staff treats the final three days kind of like a party, and that creates the perfect atmosphere for end of the year fireworks sales. To make it an even bigger Intratuin Pijnacker "event," we add music, lights and a spinning wheel of fortune!

Although the sales team is critical, we also have another team we couldn't do without: stock clerks. They make certain that orders are ready for pickup and that adequate stock exists in the bunker. They are the people who fill the orders and make certain your order is ready to go when you arrive at the pickup area behind the store. There our final team checks every order for accuracy, talks to the customers and makes certain the amount of time it takes to process the entire order is kept minimal.

We have an oversight team, too, that consists of Robin and the general manager of the Intratuin Pijnacker store itself. In essence, they are responsible for making sure that everything runs smoothly, and that every customer leaves satisfied with the correct stock they ordered. We are in constant communication with the sales team, the stock clerks as well as the team at the pickup point, so that everyone knows what is going on throughout the store. That's important so the operation runs smoothly. It helps that we've been in business for quite a number of years and that we have an excellent team we trust and that cooperates so well.

As a group, our goal is to provide our customers with a New Year's Eve experience they'll never forget and provide them with the most beautiful fireworks that money can buy. It is a challenging 3 days that take an entire year to prepare for, but it is a celebration we always look forward to doing all over again.

For Dutch pyro lovers, check out our latest news and actions on our Facebook page here LINK. This year will be spectacular so make sure you keep yourself posted. The trailer produced by Toon Gemmink for Intratuin Pijnacker can be seen below. ■

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THE HISTORY OF THE INTERNATIONAL FIREWORKS FESTIVAL

Knokke-Heist

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Written by Jack Suijkerbuijk

The Knokke-Heist fireworks festival held on a Belgian beach is one of the oldest fireworks festivals anywhere in the world. Even though I only started watching the pyromusical productions held there back in 2003, it is actually much older than that. The tradition itself actually began in Knokke-Heist back in 1969 when the City Council started searching for some type of event to logically extend the summer and make their summer season end with an emphatic bang (so to speak). Their plan was simple enough: entice tourists to stay a little longer and enjoy themselves enough to want to return to their city beach again the following year.

With the Ledure family already funding fireworks displays among several coastal cities along the Belgium coastline, and by using the highly successful festival at Cannes as an example, Knokke-Heist began to plan and organize their own festival. The first festivals actually weren't held on the beach like they are today, but on Zege Lake near the center of the city. Also, it wasn't a competition either, but displays put on for the city by Jacques Quiri, a pyrotechnician out of Paris. In the summer of '69, Quiri shot several big shows off a pontoon on Zege lake →

and entertained more than 80,000 people. Thus, the summer fireworks tradition at Knokke-Heist officially began. First, just for displays, and then evolving into an international competition.

The Festival Matures

After 5 years of inviting professional pyrotechnicians and fireworks companies from many different countries to shoot competitively at Zege lake, they again decided to change the festival somewhat and organize a new competition between all 5 of the winners from the previous 5 years. This turned out to be a brilliant move for two reasons: one, a Belgium company won the first en masse competition there that year, and two, the Knokke-Heist Fireworks Festival gained an immediate international reputation as a serious fireworks festival. But alas, even though everything had gone exceptionally well, the oil crisis in the 1970s hit the festival very hard. To counter the festival expenses, they closed off the Zege Lake area and sold ticket to the event. This was not a popular solution and ticket sales were low. In fact, ticket sales were so low, that the festival didn't turn a profit that year. Not surprising, the ticket idea was scrapped.

An Unfortunate Mishap

Poor ticket sales are one thing, but fireworks accidents are something else entirely. In 1976, after an impeccable safety record for years, the festival had its first (and only) accident. An Italian fireworks company was responsible for the mishap, but it had to do more with the lack of technology during that time period rather than carelessness. You see, there were no digital firing systems in the 70s like FireOne, Pyrodigital, Galaxis or Cobra. Instead they had a simplistic "manual electronic" system that depended on a wooden plank hammered with a row of iron nails that you connected your wires to. It was rather archaic by today's standards, but the system worked fairly well if you knew what you were doing and wrote the timing below each nail (see figure 1 and 2). Unfortunately, an overenthusiastic worker hammered the nails too deep in the wooden plank and the nails touched the metal underneath the plank. When it was time to set off the first set of fireworks, the first touch of the nail set off everything wired to it at once in one big salvo. In a matter of seconds all of the fireworks on the pontoon were fired. What was miraculous, however, was that there were no injuries or damage to the surrounding buildings. But obviously, it was time to find a bigger location for this event, one that would be safer for everyone involved and could handle larger numbers of spectators and offer safer distances from the pyrotechnics.

The Search for a New Location

Right after the mishap, the search for a new location was begun. After trying out several locations over the next several years it was finally decided that the best location was on Albert

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beach in Duinbergen near Knokke-Heist (roughly 1 kilometer from the original Zege lake location). Organizers also decided at that time they needed fixed dates for the festival, and established the following perennial dates: August 19th, 21st, 23rd, 25th and 27th (all shows beginning at 10:00 PM sharp on each date of the festival).

For Glory and Fame

The fireworks displays in Knokke-Heist are pyromusicals of the highest caliber and are shot by some of the best fireworks companies in the world. These are some of the most colorful shows seen anywhere on the North Sea and the festival now attracts fireworks fans from The Netherlands, France and even Germany. Each night on Albert beach in Duinbergen during the festival, approximately 35,000 spectators come to enjoy the displays, and each are judged by a jury comprised of local celebrities, sponsors, artists and professional pyrotechnicians. The judges watch each display from a specially prepared stage, and use the following criteria as their guide:

Synchronization

How well the fireworks are synched to the music, and how well the music melds with the fireworks being presented.

Use of Color and Color Combination

Displays must include a variety of colors to be interesting. Judges pay close attention to the number of colors used and the quality of the color combinations chosen and used throughout. →

Composition

Each firework show must be a minimum of 18 minutes in length. Each display must have a clear escalation that reinforces the display's overall inherent design. There must be a clear evolution in the rhythm and flow of the show that leads toward the finale.

Harmony

In addition to using the best quality products available, each show is expected to offer a clear balance between its music, color and fireworks choice. Winning displays must have balance, innate symmetry and melodious congruity.

Originality

The judges are always looking for something new. It may be original shapes formed by the shells used, the use of set pieces and single shot combinations, or an original soundtrack and how it was combined with new colors or shell combinations. In this festival, new is always a plus—especially if it wows the crowd.

Each season's 5 shows now include 4 competitors and a local fireworks company that shoots the final show since Belgian companies are excluded from competition in the interest of fairness. Many internationally renowned companies compete in this festival, and many return here because of how friendly the town is and the cordiality and enthusiasm of the crowd.

At present, the company that has shot the most shows in Knokke-Heist is Göteborgs FyrverkeriFabrik, a Swedish

→

WINNER - 2011 Vaccalluzzo SRL (ITALY)
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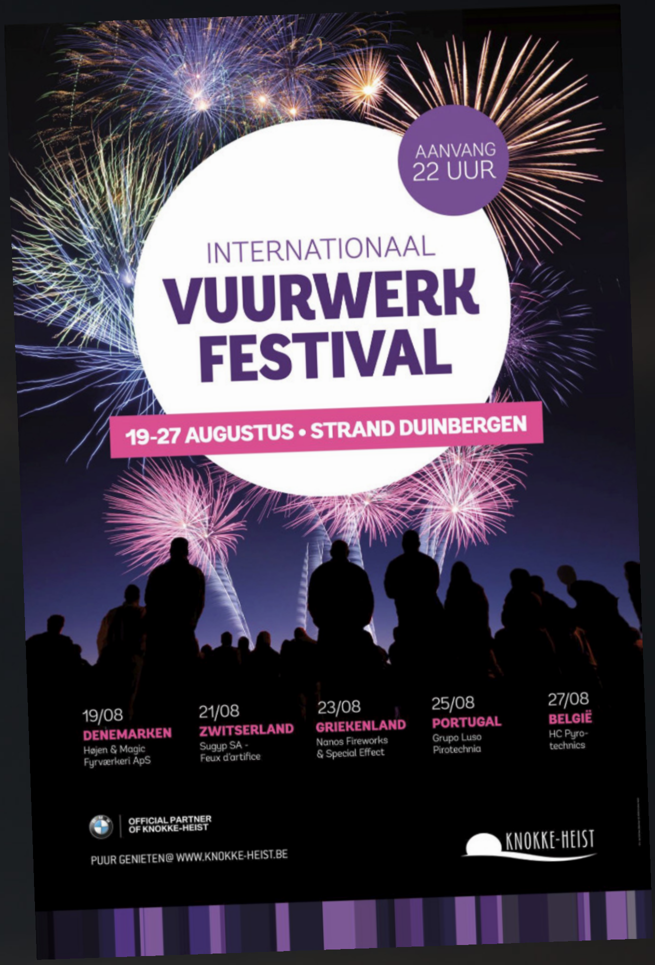
Previous Festival Winners:

1973 : Caballer - Spain
1974 : Hendrickx - Belgium
1994 : Panzera - Italy
1995 : JNS - Netherlands
1996 : Innovative Pyrotechnik - germany
1997 : Bugano - Switserland
1998 : Panzera - Italy
1999 : Weco - Germany
2000 : Pyro 2000 - United Kingdom
2001 : Göteborgs Fyrverkerifabrik - Sweden
2002 : Foti Fireworks - Australia
2003 : Thailand fireworks - Thailand
2004 : Parente Fireworks - Italy
2005 : Pyrovision - Austria
2006 : Bugano-Switserland
2007 : Göteborgs Fyrverkerifabrik
2008 : Fireworks for Africa - South africa
2009 : Göteborgs Fyrverkerifabrik
2010 : Intermède Artifices - France
2011 : Surex - Poland
2012 : Pyroemotions - Italy
2013 : Fireworks Spectaculars - Canada
2014 : Jubilee Fireworks - United Kingdom
2015 : Nanos Fireworks – Greece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fireworks factory having shot 6 shows at the festival with 3 wins! (2001, 2007 and 2009).

Even after all of my years of attendance, I am still amazed at the quality of the performances there in Knokke-Heist. I have seen both big and small companies win there. Creativity and quality is the guiding principal—regardless of the size of the company. Overall, many of the shows performed there are stunning and well worth the trip to see.

Oh, and the food there—the wonderful mussels and fresh fish from the ocean—are also worth the trip! With 5 dates in August to choose from, try to make one of them, or if you are able, stay and enjoy all 5 days! ■

Knokke-Heist 2003-2015 Playlist: CLICK HERE

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Video 1

Video 2

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Pyrolamas

Written by Jos van der Veen

When I was in Valencia for the Festival Pirotecnia in 2013, I visited Plasticos Gamon in Burjassot (Valencia). This is the home of the Valencia fireworks museum, and the company that designs and produces plastic parts used in pyrotechnics worldwide. While I was there what immediately caught my eye was a rack made of aluminum equipped with X-holders and tube-holders. What I didn't know at the time was that this was Plasticos Gamon's latest invention, what they call the pyrolamas® system.

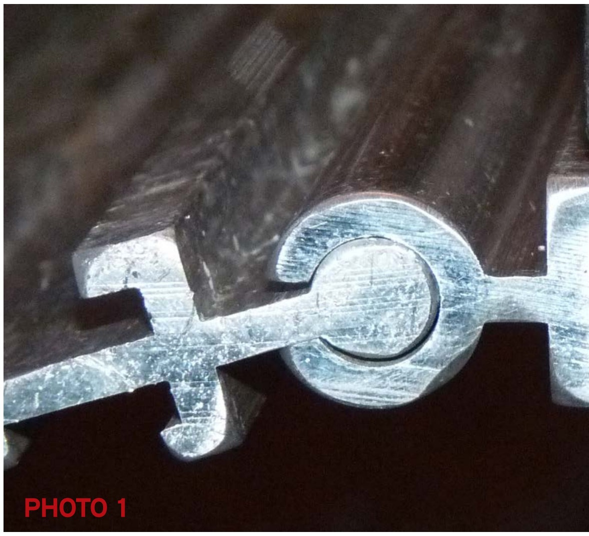


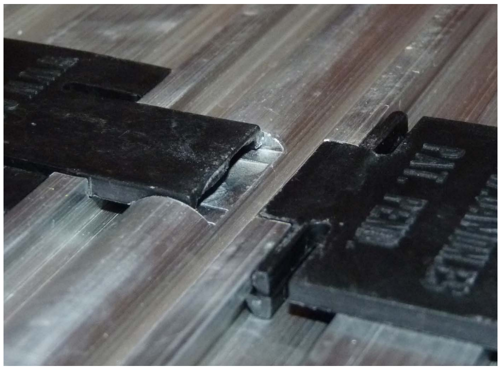
PHOTO 1

After I received a brief explanation from Toni and Fernando about how the system works , I was immediately sold on the idea. The design notion for the pyrolamas® system came to one of the owners of Plasticos Gamon as he watched a garage door function that was made of metal lamellae (lamella is a thin plate-like structure, often one amongst many lamellae very close to one another with space between). These can be rolled up quite easily and are interconnected, flexible and strong.

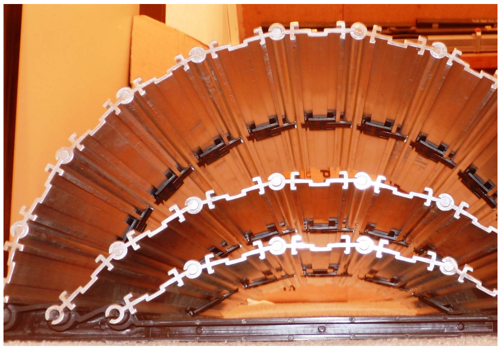
What is unique about pyrolamas?

What makes this new system so special has to do with the unique shape of the extruded aluminum making the pyrolama® sections connect easily to one another. These profiles slide exactly into each slot creating a 15 degree maximum angle of between the lamas. (See image at top)

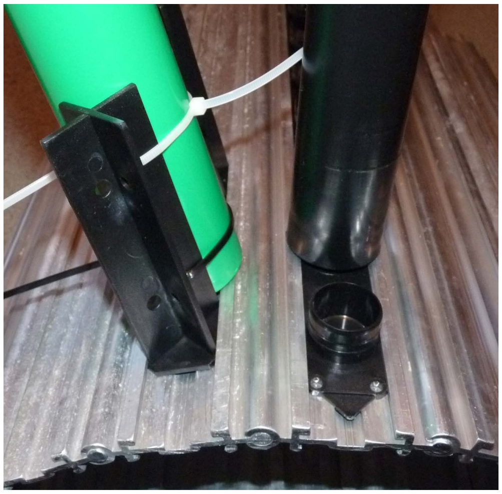
When you first get a new pyrolamas® system it is a good idea to polish the edges a little because industrial cutting can leave them quite sharp. You can see this clearly in **PHOTO 1**. Polishing the edges also makes them slide much more easily when you connect them together. To prevent the lamas from moving after they are interconnected, it comes with a simple clip you can install in the middle of the lama and easily tighten and lock



Once you put together sets of 5, 7 or 11 lamas you can place them in supporting ribs (black plastic holders) that are made to shape a solid rack and hold them tightly.



Of course, you can also choose to lay the lamas flat if you need your single-shots going vertically. Each lamas has a 38mm wide slit where you place the X-holders or the plastic sliders with the sockets. These sockets are designed to hold plastic single-shot tubes made by Plasticos Gamon.



Before the pyrolamas® was invented, Plasticos Gamon produced fixed angle (15°) plastic racks with milled slots in them allowing use of the same parts to slide in. This new innovative system makes the racks much stronger, and easier to transport and store. It also makes it possible to alter the shape and achieve more accurate angles.

The fact that this pyrolamas® system is small, lightweight and stackable makes it wonderfully flexible. The building blocks fit perfectly together to make sturdy, durable single-shot racks.

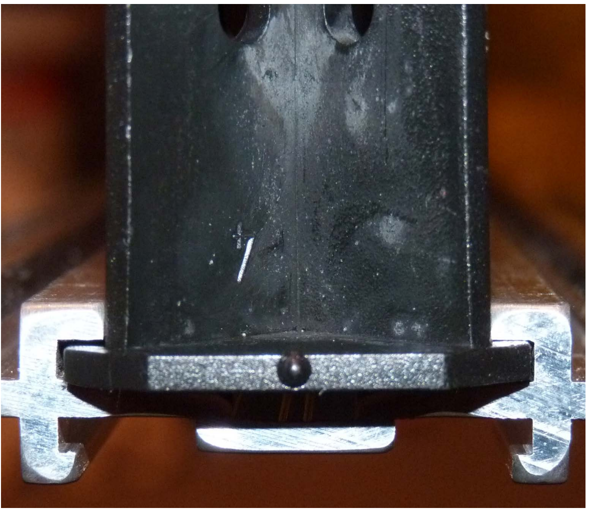
It is the strength and versatility of the pyrolamas® system that convinces many pyrotechnicians to use them.

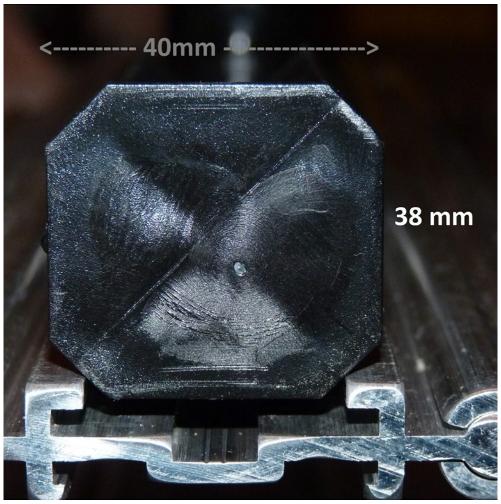
Now that this system has been on the market for two years, some new features

Visit the Pyrolamas website here >>> www.pyrolamas.com

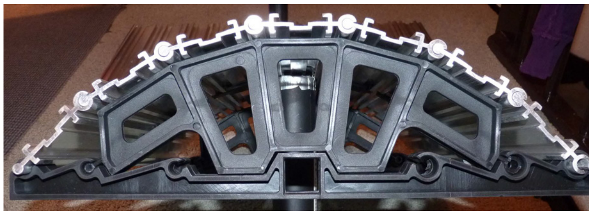
have been developed to make this system even more multi-functional:

- They've added lamas to form an angle of 30° when connected. This was developed particularly for one client, but now can be purchased by everyone. These are used in sets of 3 to make a -30 / 0 / +30 rack.
- The 30° lamas have slits 40mm wide instead of 38mm making it possible to fit single-shots with a base like Ricasa or for Europla single-shots.
- Pyrolamas® also come with 40mm slits that make 15° angles.
- New X-holders have been designed to fit the 38mm and 40mm pyrolamas®. Twisting them quarter-wise will make them fit in both 38mm and 40mm lama.

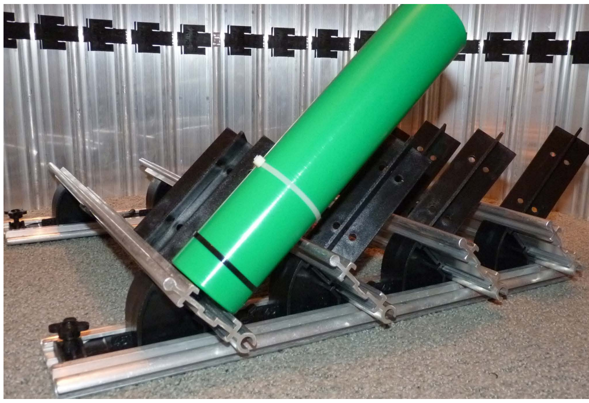




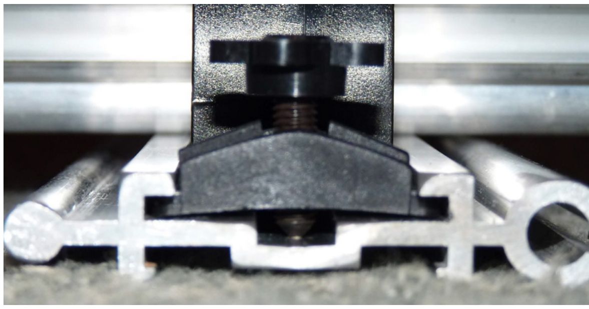
- Supporting ribs are now available to fit 3, 5, 7 and 9 lamas at an angle of 15°. 9 Lamas make a rack with maximum angles of + or -60°. This is steep enough for most displays, but if you really want the + or – 75 added you can shape an arch of 11 lamas. To do this I advise you either buy current stock at Plasticos Gamon, or from one of the resellers of the 5, 7 or 11 lama supporting ribs.
- Supporting ribs are available for 5 & 3 lamas at an angle of 15°.
- Supporting ribs are available for 7 & 5 lamas at an angle of 15° or 3 at an angle of 30°.
- Reinforcing supports for arches of 7 or 9 lamas are available. If you think you'll be using the pyrolamas® system to its maximum these might come in handy. (I tried multiple rows of Italian 45mm single-shots already and the pyrolamas® handled it easily. If you need to fire larger calibers on the racks like 60mm or even 75mm these supports should give you an extra sense of security).

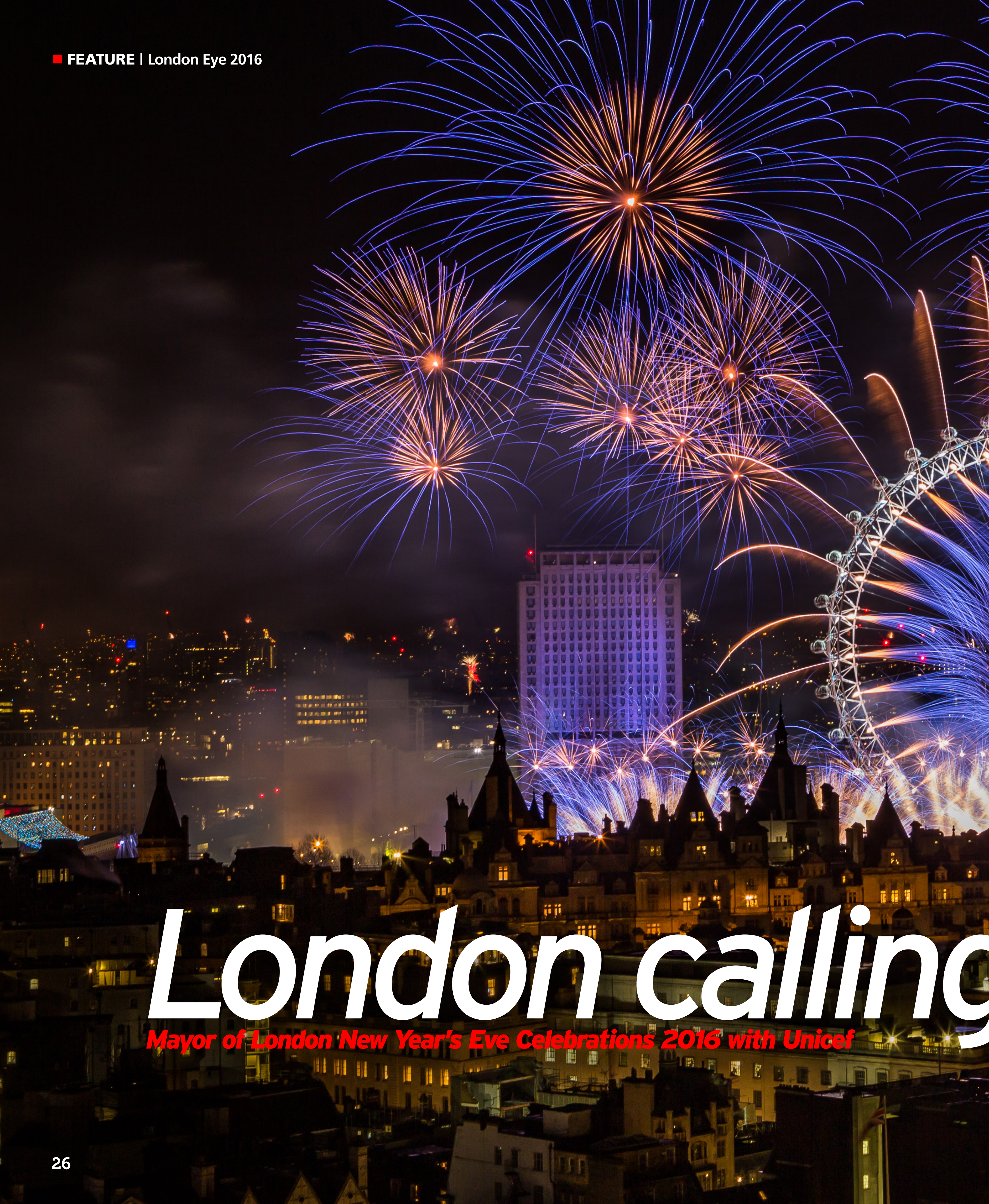


If all this weren't enough already, the latest invention Plasticos Gamon has developed is a system with angles allowing you to place one lama perpendicular on two other lamas to achieve almost any desired angle you want. You can purchase these in sets of 2 for each angle. Here are the angles you can achieve: straight (0°), 10°,15°,20°, 30°, 40°, 45°, 50°, 60°, and 80° degrees. This allows each user to place a great many single-shots in a wide variety of positions.



And finally, you can get separate locking screws or stoppers to prevent the perpendicular lama from sliding out of its 2 supporting lamas. ■





London calling

Mayor of London New Year's Eve Celebrations 2016 with Unicef

Written by Darryl Fleming - Director Titanium Fireworks Ltd

For 2016 the Mayor of London's New Year's Eve Firework display was for the first time partnered with Unicef, providing a spectacular pyromusical display from the Coca Cola London Eye. →

In its current format, firing from the River Thames and the iconic London Eye, the display is now in its 12th consecutive year, and is produced by Jack Morton Worldwide who have been involved with the delivery of this display since its inception in 2004. Jack Morton are responsible for the overall event plan and production including crowd safety, ticketing, signage, liaison with the many agencies involved to deliver the event, as well contract and oversee the creative elements of lights, sound and of course the fireworks. Titanium Fireworks have delivered this display for the last three years and for me personally it is the 6th year that I have designed and project managed the delivery of this prestigious display.

The display is part of the major national celebrations to mark the midnight moment and see London appear on the roll call of cities celebrating New Year's Eve around the globe. Broadcast live on the BBC to an estimated 13 million viewers and watched by hundreds of thousands more live along the river bank and any vantage point where people can view the display. The Mayor of London New Year Firework Display has become one of the most popular events worldwide. Due to its success the event had to be ticketed for the first time in 2015 to manage the numbers of people who descend on the city centre to watch the 11 minute show synchronised to Big Ben's chimes and a 10 minute soundtrack.

My initial involvement in 2010 saw the display become a pyromusical for the first time, prior to that Groupe F had delivered six stunning shows using the fireworks as the soundtrack creating their own rhythm. Keen to add an extra dimension to the display, Jack Morton wanted to introduce a separately produced soundtrack to which the Fireworks could be synchronised, the soundtrack would provide a narrative for the display and to reflect the diversity and multicultural society of London, the brief was to create a soundtrack that shouted London and that if taken out of context and put alongside a display anywhere else, it just would not work, it had to be London centric and quirky.

Planning for the display starts around September with a creative brainstorm to come up with ideas for the soundtrack, this year the soundtrack was produced by a company called Bounce, Nic and Dan would meet up in the studio with David Zolkwer, the creative Director of Jack Morton to play through a number of ideas. As soon as the shortlist starts to develop the soundtrack is shared with us to make sure that the structure and duration can work for a

→

pyromusical. With up to 15 draft versions flying back and forth we finally get to a positon where we are happy with the music, the final soundtrack is then run past the client for final approval and the BBC to ensure there are no copy right issues, in the past we have had to remove tracks for this reason, the final sign off for the music was mid-November, with just under 6 weeks to go, we start the design process and then go into full production to deliver this event.

Given that the real estate we have to play with is very prescriptive, in that the display has to be centred on the Eye and river Thames, together with a significant audience who effectively surround the site on all sides, we have to be very careful with the selection of fireworks we can use, this extends to type and calibre. Winter in the UK can be fairly bleak at times and winds blowing towards the audience would cause us potential issues. We always design redundancy in to the display at the early planning stages to ensure the display is as robust as possible even in unforgiving weather conditions.

The location and number of firing positions are designed in form the basis of the choreography with 32 inner firing positions from the Eye and 24 outer firing positions, with a further 16 positions fired from a complete 360 degree arc from the hub or central spindle. On the river Thames, we have three large barges each with 11 firing positons for roman candles and single shot effects, a large quantity of shells from 75mm up to 150mm and finally a frontage of 15 positions between the outer barges on smaller floating pontoons and the pier, in total the position file contains 132 separate firing locations.

We use FireOne Scriptmaker to design this display and once complet, we convert the fire file in to a showsim file to create a simulation of the display. The simulation serves two purposes, the first is to illustrate to the creative team how the show will look, this allows Jack Morton to critique the display and suggest changes wherever they be required. The second purpose of the simulation is to share the design with the BBC so that they can get a feel for the display and reference certain timelines where the camera shot needs to be head on to the Eye, or a wider shot to capture the aerial sequence is preferred. We find a couple of meetings with the television director to run through the display greatly assists in the final broadcast, it is a very difficult job to film a live show, especially a firework display which can be unpredictable, varied and cost prohibitive to rehearse.

> *"The display requires a total of 190 two wire FireOne modules to fire the 5,800 cues in just under 11 minutes, the London Eye requires the use of special shielded data cable with a drain wire. The reason for this is the high interference we get from both radio and electromagnetic interference which can affect the communication of the firing panel."*

Alongside the design process we produce all our documentation, risk assessment and method statement to the various stakeholders. One of the significant issues we address before we even turn up to rig the show, is the scale and size of display that will be fired in certain wind conditions. A detailed curtailment plan is produced where we scale back the display dependent on different wind speeds and directions. Woking with Tom Smith, we use Shellcalc, which is a useful modelling tool to plot the scenario for debris distribution in a number of different wind speeds and directions. From this information we draw up a scale of show that will be fired for each prevailing wind on the day, ultimately we know at what wind speed the display needs to be cancelled for any given direction, this is

important to agree in advance as a large scale public display such as this cannot be called off 20 minutes before midnight, the decision will be made much earlier in the day to cascade the information to all the various agencies and to inform the public not to travel into the city. In all we design 4 separate displays, each one more scaled back than the first where the aerial star shells are progressively removed from certain barges until the point of cancellation.

After a couple of weeks of design and a run through of the simulation the final changes and tweaks are made to produce the final fire file and the various reports to put the show together. We have three separate teams producing the various elements of the display with one team concentrating solely on the London Eye, attaching 1,200 shot tubes and candles to the 48 props that are rigged to the inner rim of the Eye and Hub, the second team match and fuse the aerial shells, number and label and then re box per position or location, the third team work on all the single shot plates for the front positions and the 33 roman candles positions on the barges. In all we have a production team of 10 technicians working for three weeks to prep and label all the fireworks ready for the rigging on site.

The onsite delivery of the event is split across two teams, the first is a crew of 26 who rig the three barges and the pontoons over five days and one day derig and the second team work on the London Eye rigging the 32 pyro holders, running the data cable and networking the modules ready to receive the fireworks which cannot be loaded until the day of the display. The Eye crew consists of 10 working at height technicians for 6 days and 2 days de rig. Rigging the Eye is the most challenging and time critical evolution of the entire display.

The London Eye consists of 32 capsules, one for each borough that makes up the Greater London Authority. At 135m, the Coca Cola London Eye is the world's largest cantilevered observation wheel. As one of the busiest tourist attractions in London, time to work and rig on the Eye is at a premium. Our crew have to work through the night when the attraction is closed to rig and attach our bespoke cradles and network all the FireOne modules. The real challenge comes on the day of the display when the fireworks cannot be rigged until the last ride has been completed and the moving head lights are loaded in to each capsule for the lighting display. On the New Year's Eve, we normally do not get the Eye handed over to us to start rigging until nearly 18:00, with the desire for the wheel to be locked down and in show position by 22:00 ready for the pre-show, we only have four hours to load and attach 1,200 fireworks to the 32 cradles and 16 positons on the Hub.

The display is fired using FireOne, we have three separate controls, one on each of the Left and Right Barge and a third behind the London Eye which fires the middle barge and the London Eye, there are four separate systems required to fire the show each with a primary, back up and tertiary system, in all twelve XL4 firing panels are synchronised using GPS functionality. In reality we don't actually fire the display at midnight, in fact the systems are armed and synchronised by 23:45, where we fire test igniters at each control panel every 30 seconds for the 15 minutes running up to the midnight moment, that way we know that everything is working and running correctly, it would be too excruciating to wait until the first chime of Big Ben to know whether the display will fire or not. There is a degree of irony using all this 21st century digital technology which is in complete contrast to the 200 year old clock which signifies the midnight moment with the chime of Big Ben, the timing of the clock and chimes is monitored daily to make sure they are accurate and the method used to alter the speed of the clock is by adding or reducing the number of old pennies on the pendulum, it truly is digital versus analogue technology.

The display requires a total of 190 two wire FireOne modules to fire the 5,800 cues in just under 11 minutes, the London Eye requires the use of special shielded data cable with a drain wire. The reason for this is the high interference we get from both radio and electromagnetic interference which can affect the communication of the firing panel. With miles of 63amp three phase cable running around the Eye and the pier to operate all the lights required for the show combined with all the RF interference from the wireless control of the lights combined with the very prickly environment in that part of London.

Working on this exciting project is a real privilege and one which offers truly memorable experiences, being part of a national celebration and delivering a spectacle that will be viewed by millions around the world is an honour. For more information please see our A to Z of how we produce and deliver this display which is available on our website, www.titaniumfireworks.com, we would like to thank all our hard working crew, Jack Morton Worldwide and our photographers, Nick Alloway and Cris Mathews for capturing some truly amazing images.

➔

My experience of the London Eye fireworks

Written and images by Julien Batard

What could be better than to start off the New Year with an XXL fireworks display? I came up with that idea last summer and decided I wanted to see some great fireworks in a wonderfully picturesque location. London on New Year's Eve in front of the London Eye fit both criteria quite nicely.

For those of you who aren't familiar with The London Eye, it is not really an eye at all but a giant Ferris wheel sitting on the South Bank of the River Thames. The structure is huge: 443 feet tall (165 m) with a wheel diameter of 394 feet (120 m). It is Europe's tallest Ferris wheel and offers one of the best views of London when you reach the top. On New Year's Eve they literally light up this marvel with fireworks extraordinaire, and if you're lucky enough to have a ticket for one of the "official viewing platforms" (cost £10), you're in for a real visual treat. This year they sold 113,000 of those tickets, and the total crowd in downtown London there to watch this spectacle was estimated to be around 250,000 people.

Not that I was a just a simple ticket holder. I was much luckier than that. When I arrived in London, I had the opportunity to meet with Darryl Fleming and his team from Titanium Fireworks. They showed me a simulation of the upcoming New Year's Eve spectacular they had prepared. It was going to be HUGE! Now it was just a matter of securing all of the necessary access passes I needed to enter my front and center location. Finding the perfect spot to photograph an event like this is always a challenge—especially in a big crowd. My ticket and pass, however, made that much easier. The biggest problem I was going to have on this New Year's Eve was the long wait until midnight.

What I noticed from my prime spot after I arrived was how attached the Londoners were to this show. By late afternoon the banks of the Thames were already packed with people and more kept arriving all of the time. Why not? Even though the fireworks spectacle would be short (just 11 minutes 15 seconds long), there would be a 400-meter wide display that you really have to see and experience to believe. What it lacked in length, it made up for in luster and intensity. 3000 single shots in 11 minutes anywhere is a lot of shots!

When the speaker announced the final minutes of 2015, the excitement electrified the crowd. Honestly, it was palpable and you could feel the intensity of the moment run through the crowd like a wave. Finally, the crowd began the final countdown of seconds: 10... 9... 8... 7… The long awaited moment had finally come! It's hard to describe the happiness and pyrotechnic bliss I felt as Big Ben rang in the New Year with 12 chimes accompanied by bursting bombs.

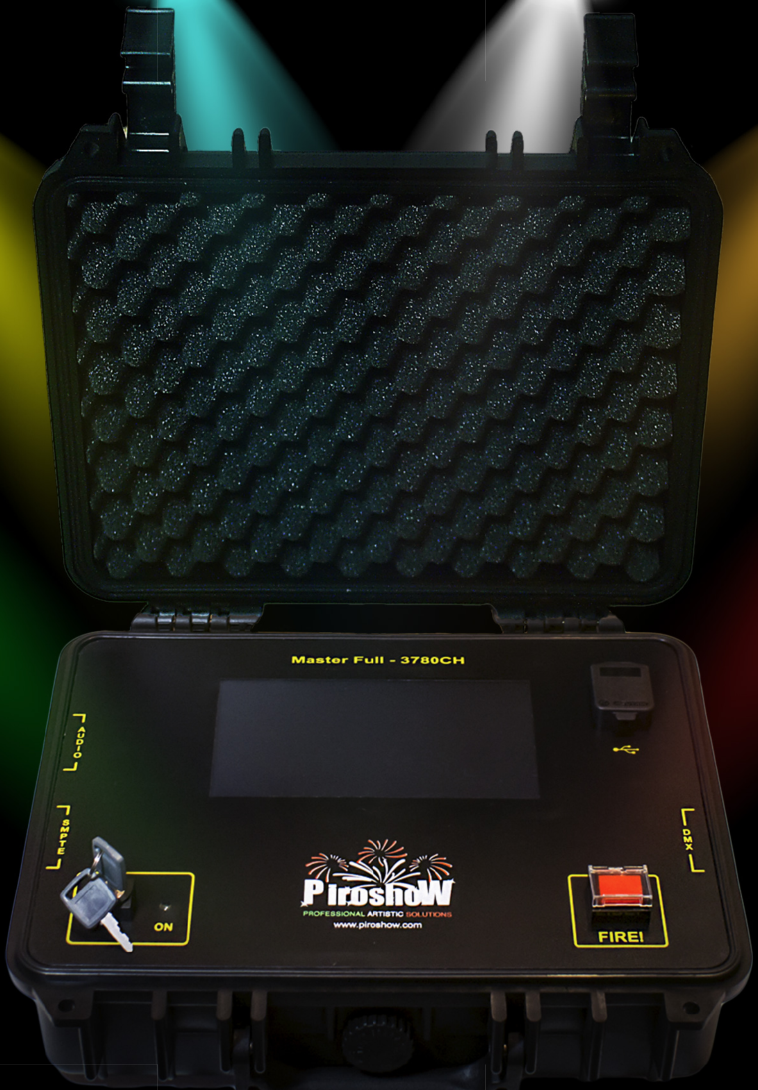
The calm prelude didn't last for more than 13 seconds before the madness of the fireworks outsized the London Eye itself. The single-shots were magically fired to the music and almost instantly the entire facade became colored blue! The powerful beat of Pop music became the pulse of the colorful shots as the rhythmic cadence of Queen, Michael Jackson and many more partnered themselves with the powerful display.

For a photographer like myself, the variation of the scene and dynamic designs were a challenge to capture—especially the shapes and single-shots. To my left, another photographer danced as he created his imagery. You go Darryl!

The intensity continued to build as shots filled more and more of the night sky. Shells blinking and vibrant noise was everywhere, rattling every building, every window and everyone's bones as well. By the finale, the London sky was entirely filled with gold and I felt my feet lift off the ground just from the exhilaration of it all. It took me a few seconds to come back to reality as it dawned on me I had just fulfilled another dream of mine. Life is good.

The display created by Titanium Fireworks was perfect. The jubilant crowd roared their approval. I would like to send a big thank you to Darryl Fleming and his crew for creating this pyrotechnic wonder. And to the Londoners, well, you haven't lived until you have heard 250,000 people sing a mass rendition of Auld Lang Syne together. ■

MASTER FULL



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- LIGHTS
- FLAMES
- MUSIC

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THE CHRISTMAS FIREWORKS OF Gouvieux

Written by Christophe Blanc

A Christmas market is an open-air market usually associated with the celebration of Christmas in some way. Most of them are traditionally held during Advent and contain anything and everything related to this exceptionally popular and most religious of holidays. Mix that together with the innate beauty of France, and what you get is a wonderfully beautiful Christmas market ripe with diversity and heterogeneity.

Gouvieux is a commune just north of Paris, France, located in the Chantilly metropolitan area. Their Christmas market is a family-friendly market hosted right in the middle of town at the City Hall square. This Christmas market boasts small Christmas chalets exhibiting a myriad of regional products and regional crafts, as well as an abundance of tartiflette (a wonderful French dish made with potatoes), waffles, mulled wine and French hot chocolate.

The fireworks for this event are fired directly above City Hall, so as you can imagine, it is very difficult to find some space—especially amidst a crowd of over 10,000 people—to place a tripod. Since I had already noticed some beautiful Christmas lights in an area surrounding a nearby church, I decided to frame my picture with beautiful blue lights sparkling in the foreground as the fireworks display lit the sky in the background. The added bonus was the people walking by, adding life to this wonderful Christmas scene.

Christmastime in Gouvenieux! What could be better! The French pyrotechnic company Prestatech-Artifices provided the fireworks for this Christmas market, and did a magnificent job. If you are able, try to make plans to visit Gouvieux to discover the magic of this Christmas market some December in the future. It is certainly worth being there just to marvel at the numerous fir trees heavily laden with colored lights. ■

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THIS IS

FALLAS 2016

Pyrotechnic Magazine will be bringing you the best pictures, news and videos via our on-line magazine & Facebook page, of the 2016 Fallas event in Valencia, Spain...

We can't wait for it to begin!

FALLAS 2016 PROGRAM

DATE	TIME	TYPE OF DISPLAY	PIROTECHNIC COMPANY	WHERE THE EVENT WILL BE HELD
27/02/2016	18.00h	Mascleta Aerial	Pirotecnia Valenciana	Paseo de la Alameda
28/02/2016	07.30h	Classic Desperta	Pirotecnia Zarzoso & Pyroshopping	Calle de la Paz
28/08/2016	08.00h	Desperta Finale	Pirotecnia Valenciana	Plazal del Ayuntamiento (City Hall Square)
28/02/2016	14.00h	Mascleta	Pirotecnia Valenciana	Plazal del Ayuntamiento (City Hall Square)
28/02/2016	20.00h	La Crida	Pirotecnia Valenciana	Torres de Serranos
01/03/2016	14.00h	Mascleta	Pirotecnia Peñarroja	Plazal del Ayuntamiento (City Hall Square)
02/03/2016	14.00h	Mascleta	Pirotecnia Nadal-Marti	Plazal del Ayuntamiento (City Hall Square)
03/03/2016	14.00h	Mascleta	Pirotecnia Mediterraneo	Plazal del Ayuntamiento (City Hall Square)
04/03/2016	14.00h	Mascleta	Pirotecnia Alpujarreña	Plazal del Ayuntamiento (City Hall Square)
05/03/2016	14.00h	Mascleta	Pirotecnia Hermanos Ferrández	Plazal del Ayuntamiento (City Hall Square)
05/03/2016	00.00h	Mascleta Nocturna	Pirotecnia Marti	Plazal del Ayuntamiento (City Hall Square)
06/03/2016	14.00h	Mascleta	Pirotecnia Vulcano	Plazal del Ayuntamiento (City Hall Square)
07/03/2016	14.00h	Mascleta	Pirotecnia Maria Angustias Pérez	Plazal del Ayuntamiento (City Hall Square)
08/03/2016	14.00h	Mascleta	Pirotecnia Marti	Plazal del Ayuntamiento (City Hall Square)
09/03/2016	14.00h	Mascleta	Pirotecnia Gironina	Plazal del Ayuntamiento (City Hall Square)
10/03/2016	14.00h	Mascleta	Pirotecnia Alacantina	Plazal del Ayuntamiento (City Hall Square)
11/03/2016	14.00h	Mascleta	Pirotecnia Tomás	Plazal del Ayuntamiento (City Hall Square)
12/03/2016	14.00h	Mascleta	Pirotecnia Crespo	Plazal del Ayuntamiento (City Hall Square)
12/03/2016	00.00h	Digital Fireworks Spectacle	Pirotecnia Piroquiles	Plazal del Ayuntamiento (City Hall Square)
13/03/2016	14.00h	Mascleta	Pirotecnia Valenciana	Plazal del Ayuntamiento (City Hall Square)
14/03/2016	14.00h	Mascleta	Pirotecnia Aitana	Plazal del Ayuntamiento (City Hall Square)
15/03/2016	14.00h	Mascleta	Pirotecnia Turis	Plazal del Ayuntamiento (City Hall Square)
15/03/2016	00.00h	Castillo	Pirotecnia Zarzoso	Paseo de la Alameda
16/03/2016	14.00h	Mascleta	Pirotecnia Zarzoso	Plazal del Ayuntamiento (City Hall Square)
16/03/2016	00.00h	Castillo	Pirotecnia Caballer FX	Paseo de la Alameda
17/03/2016	14.00h	Mascleta	Pirotecnia Caballer FX	Plazal del Ayuntamiento (City Hall Square)
17/03/2016	01.00h	Castillo	Pirotecnia Hermanos Caballer	Paseo de la Alameda
18/03/2016	14.00h	Mascleta	Pirotecnia Hermanos Caballer	Plazal del Ayuntamiento (City Hall Square)
18/03/2016	01.30h	Castillo	Pirotecnia Europla	Paseo de la Alameda
19/03/2016	14.00h	Mascleta	Pirotecnia Europla	Plazal del Ayuntamiento (City Hall Square)
19/03/2016	01.00h	Crema + Mascleta	Pirotecnia Europla	Plazal del Ayuntamiento (City Hall Square)

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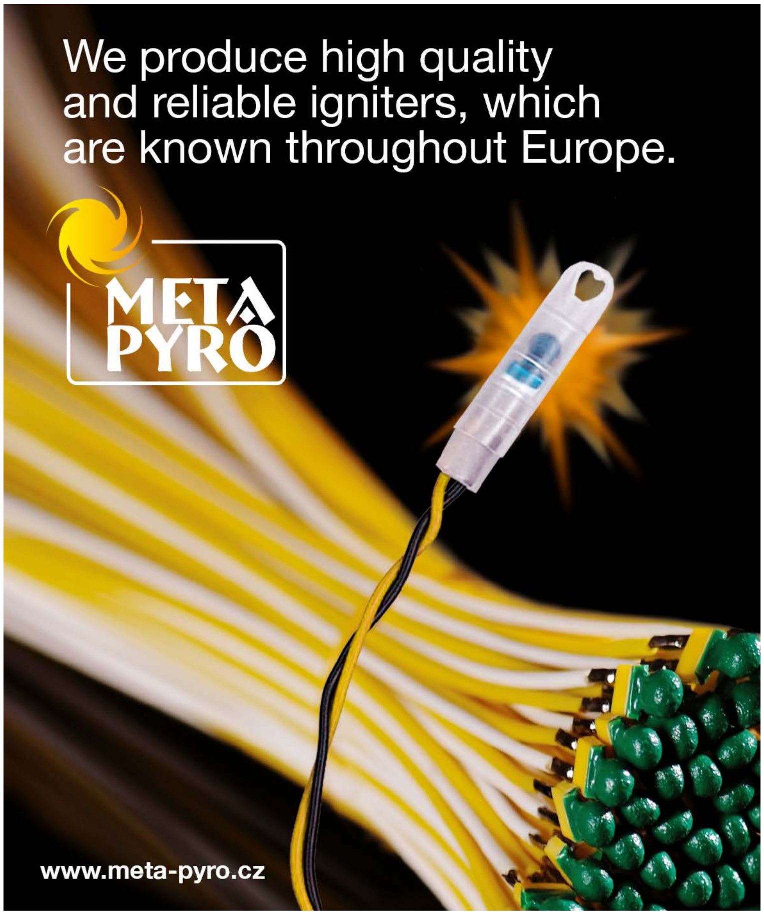
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Pirotecnia

"Nit del Foc" 2016

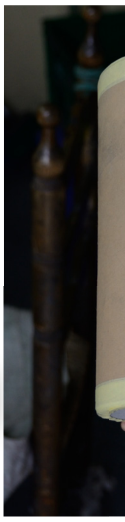
Written by Tobias Brevé
Photos by Stefan Drukker

Located in the beautiful surroundings of Belgida, close to Valencia, Spain, the fireworks company Pirotecnia Europla began back in 1977. Ever since its inception, the company has been developing and improving its fireworks and has since become one of the leading fireworks producing and exporting companies in Europe.

Besides its production and export, though, Europla has also become known for its nighttime and daylight fireworks displays. These wonderful displays are characterized by very precisely timed digital bangers (used in the inicio of the mascleta) and by the marvelous "rainbow theme" illuminating the nighttime sky with a colorfully perfect castillos. We recently had the opportunity to interview the current owner of Europla, Francisco Martínez and co-owner Salvador Armengol, both are veterans of the fireworks industry. Mr. Martínez actually started his career 25 years ago, working as an agent for Sunsong fireworks, but after several years moved over to Europla instead →

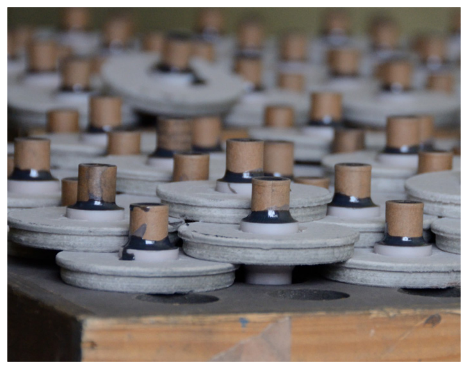
Europla

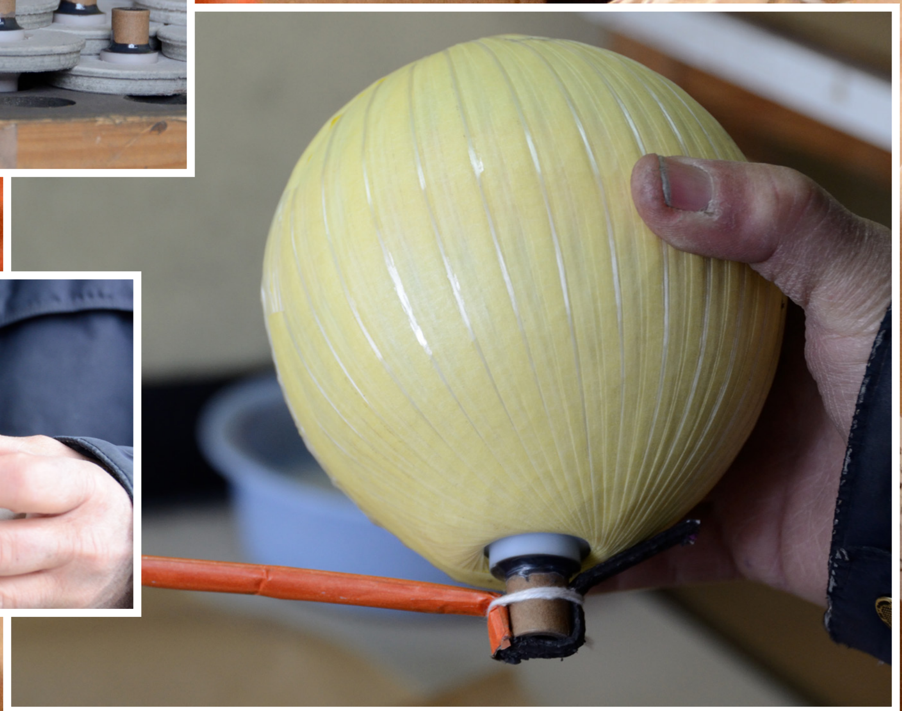
TRUENO
TERREMOTO
Nº LOTE: AYTO 19
FECHA: FEBRERO 2016
Nº2 PARA
DE MASCLETÁ
NEC:12 gr
OPERARIO: 9
E02-TTER02
FABRICACION

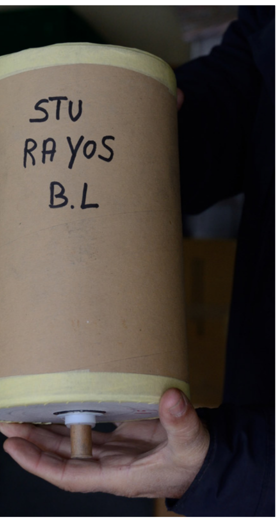


Pirotecnia Europla

"Nit del Foc" 2016

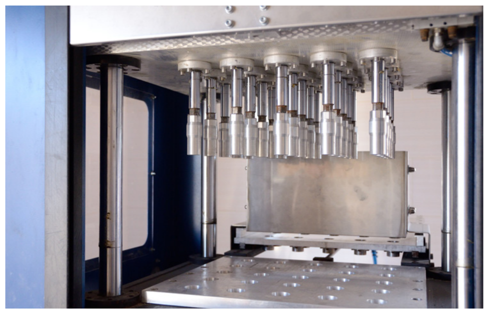






and ultimately bought the company in 2004. This year Europla was bestowed the great honor of firing the final castillo during Fallas de Valencia. Better known as "Nit del Foc" and the mascleta ultima at dia San Jose, this is the most important day of Fallas.

As the director and owner of Europla, Mr. Martínez conveys a clear vision about the future of his company when you talk to him, a company that is not only determined to expand production capacity to export his products throughout Europe, but ultimately expects worldwide expansion as well. Today its modern, well-outfitted factory touts a 100,000 square meter area encompassing 11 storage bunkers and 10 production bunkers. Despite its very efficient machinery, however, Europla still employs 25 production workers who operate the machines and also craft some high quality products by hand. Their latest piece of high-tech equipment is a Roman candle press, which has a capacity of 25 Roman candles per batch.



As mentioned above, Europla is well known for its digital banger sequences during their mascletas, so it should surprise no one that Mr. Martínez is a degreed pianist. Obviously, he uses his musical understanding and temporal skill to produce what many call the finest rhythms and timings of digital bangers, whistlers and salutes in the inicio of the mascleta anywhere. Ever since Europla was scheduled to fire the mascleta ultima during this year's Fallas (this takes place in Valencia from March the 1st through the 19th), Francisco has used his skill and creativity to design a new, even more harmonic incio for the mascleta. The beat should be astounding!

Besides being an accomplished musician, Mr. Martínez has a devout passion for

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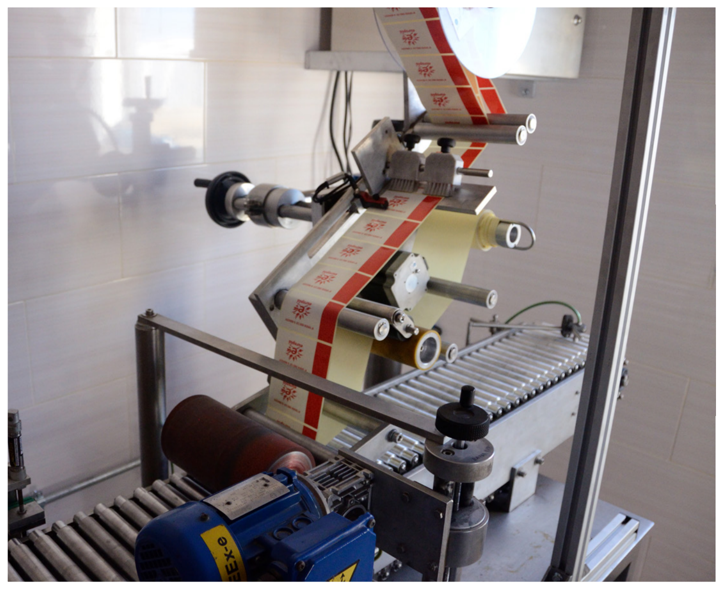


Pirotecnia Europl

“Nit del Foc” 2016

chemistry as well, and he uses this chemical knowledge to develop formulas that produce absolutely stunning pyrotechnic colors. These are the colors used to create the vibrant rainbow theme, which is the hallmark of Europla's castillos. As noted, Europla is constantly improving and developing new products and formulas. In fact, their newest products are safer, smokeless and much more eco-friendly. One example of their genuine eco concern has been the reduction of perchlorate containing salts used in their pyrotechnics that can contaminate soil and groundwater. Other major improvements relate to the performance of their products in high and low humidity. This is critical when your fireworks have to ignite in a rainy country like England or during the hot and humid summers in Valencia.

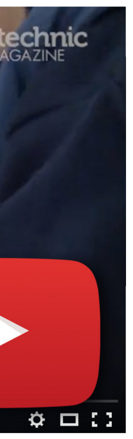
More of a challenge today, Mr. Martínez explains, is chemical consistency. Quality depends on the consistency of the chemicals used and the mixing precision and the procedures used to make each formulation. Europla's consistency, especially in the production of colored stars, is well controlled now and should be even better in the future because part of their factory will soon be devoted to synthesizing their own more complex chemicals, which will be used for smokeless products. This will be a huge quality control enhancement for Europla products since they will no longer be dependent on the quality standards of their chemical suppliers. In addition, this will give them complex chemical capability that they cannot achieve by using a supplier.

As if that were not enough of an achievement, Mr. Martínez also plans tackle the chemical consistency and quality of their black powder. Interestingly enough, the main ingredient for perfect black powder is found in the wood of grape vines. This wood is burned down into charcoal and subsequently processed for use in black powder. 25 years ago the agricultural environmental conditions were perfect for the production of just the right kind of charcoal necessary. Today that is not the case, and the change in agricultural methodology has resulted in a somewhat different vine wood. Since the wood is somewhat different, the charcoal is as well. This makes it exceptionally difficult to produce highly consistent, high quality black powder. This problem motivated Mr. Martínez to experiment in his laboratory to find a better formulation and processing mechanism to produce much better black powder with higher quality and consistency.

In short, Europla is a continually innovative company. They don't believe in resting on their laurels regarding any of their products. There are exciting new plans for an entire new line of daylight fireworks products now. As mentioned, Europla is well known for the brightness and color purity of their nighttime fireworks. Currently, Europla is working to develop colored smoke products just as intense as their nighttime line. This is quite a challenge since most dyes used in smoke are not biodegradable and can harm the environment. Europla is exploring this segment of the pyrotechnic industry in the hopes of creating an environmentally friendly daylight smoke product line.

In conclusion, Francisco Martínez certainly knows what direction he plans to take Europla in the future. By expanding the production capability and exporting their high quality products throughout Europe, they have a much better chance of becoming a player on the world firework marketplace. Being a man with a passion for music and chemistry certainly helps, but being a man with a vision and the skill and tenacity to make it happen is a true gift.

Along with thanking Mr. Martínez for taking the time to talk to us and for showing us around the Europla facility, we would also like to thank Salvador Armengol and all other employees working at Europla for their hospitality and willingness to explain Europla's long term vision to us (as well as giving us a sneak peek at the upcoming spectacle set for Fallas de Valencia). ■



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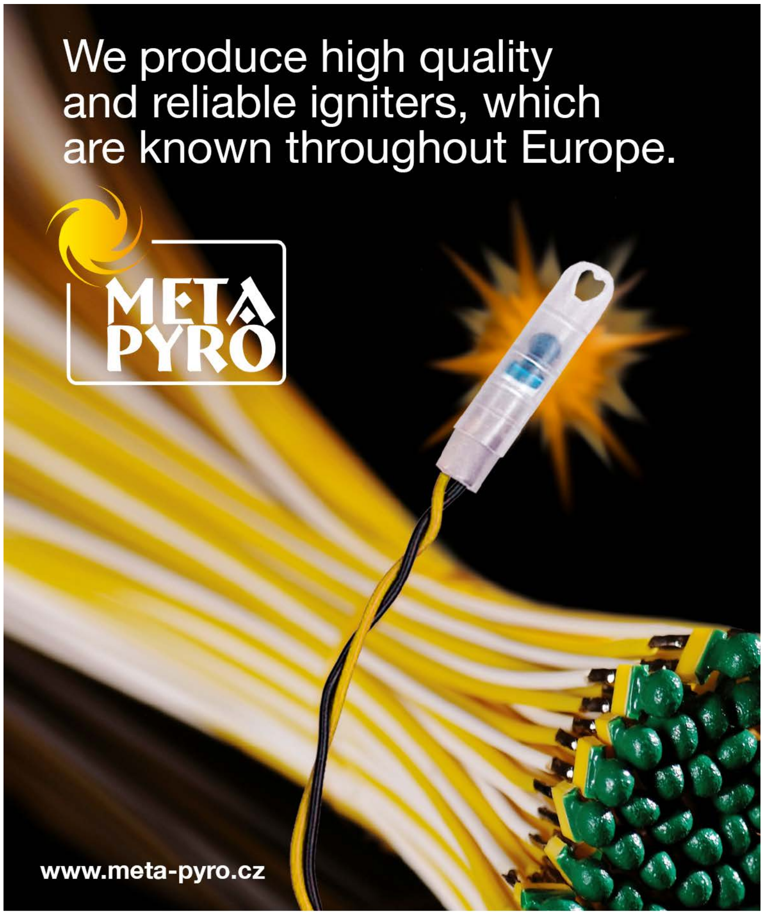

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Hermanos Caballer

& FALLAS DE VALENCIA 2016

Written by Tobias Breve • Photography by Stefan Drukker

The Caballer family name is famous throughout all of Spain.When you think about traditional Valencian fireworks, the Caballer name is the first to come to mind. And it is a family affair and a family-run business enterprise dating all the way back to the 1880s. →

TIPO: CARCASA
SUBTIPO: TRUENO DE AVISO
NOMBRE: CAR-CIL. T.A.
CALIBRE: 50 MM.
CATEGORIA: 4
1163
CARC. CIL. 50 MM. TRUENOS DE AVISO
Fabricado por: Hermanos Caballer Pirotecnicos
Fecha de fabricación: 2016

Hermanos Caballer

& FALLAS DE VALENCIA 2016

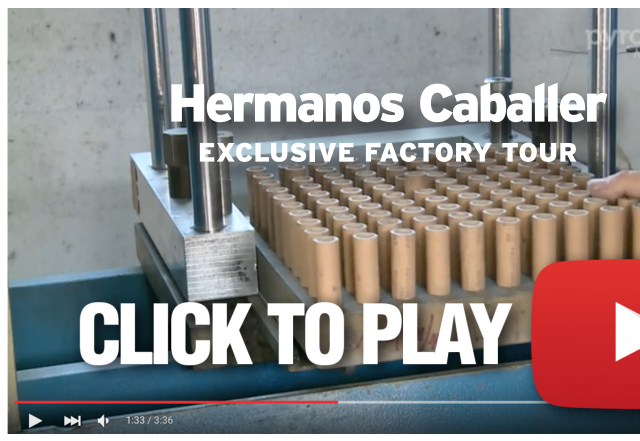
Hermanos Caballer today is a relatively new company established in 2001 and located in the surrounding area of Almenara, which is close to Valencia, Spain. They specialize specifically in the production of high quality daylight and nighttime fireworks, as well as firing traditional castillos and mascletas. This year Hermanos Caballer is scheduled to shoot a castillo on March 17th and a mascleta on March 18thduring Fallas de Valencia. Lucky for us, we were allowed to visit the Hermanos Caballer factory just prior to these Valencia shoots and our visit provided us with genuine insight into the true traditional craftsmanship involved in producing these upcoming spectaculars.

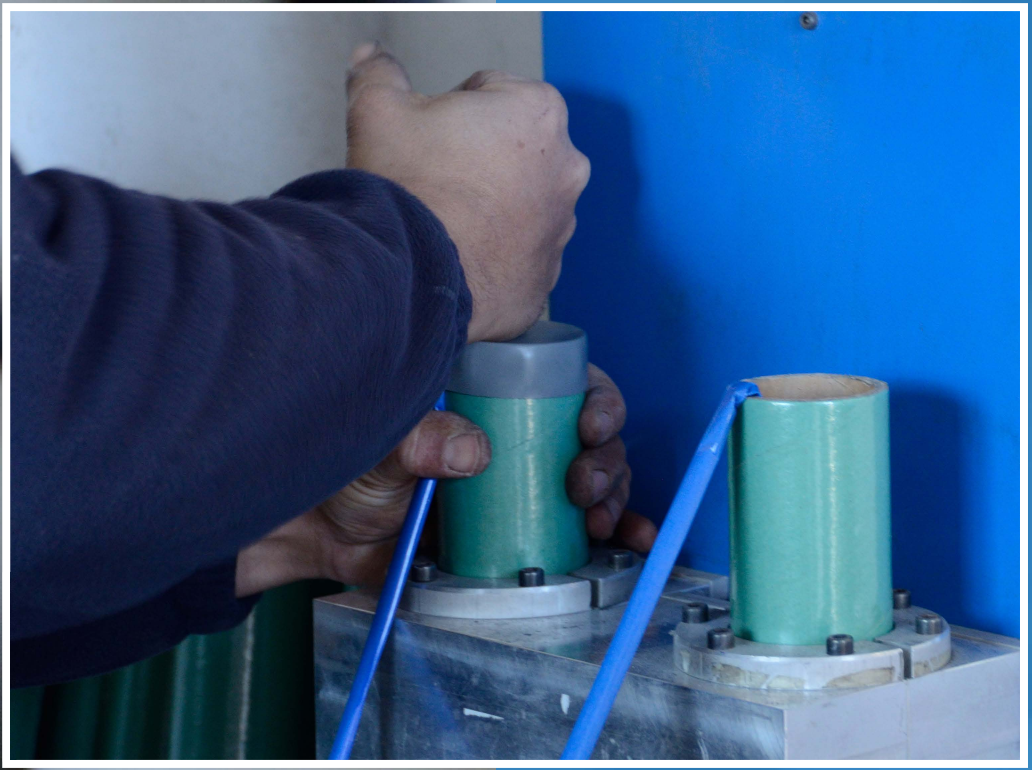
After a relatively short drive from Valencia, we arrived at the Hermanos Caballer factor where the founders, Jose Vincente Caballer Villacañas and Jorge Caballer Villacañas, were waiting for us. After a brief conversation, Jorge guided us into their factory facility. We began by inspecting the main working bunker where some members of the team were there preparing bundles of“7 reports” and “serpentinas” (whistlers), which later in the process are used in their roman candles. Simultaneously, other team members were preparing strings of “trueno de avisos” (salutes) including delays between each salute, to be used during the salute finale. As we watched the teams work, we couldn’t help but notice how closely and how well the team members worked with one another. It was definitely a close-knit, friendly work environment.

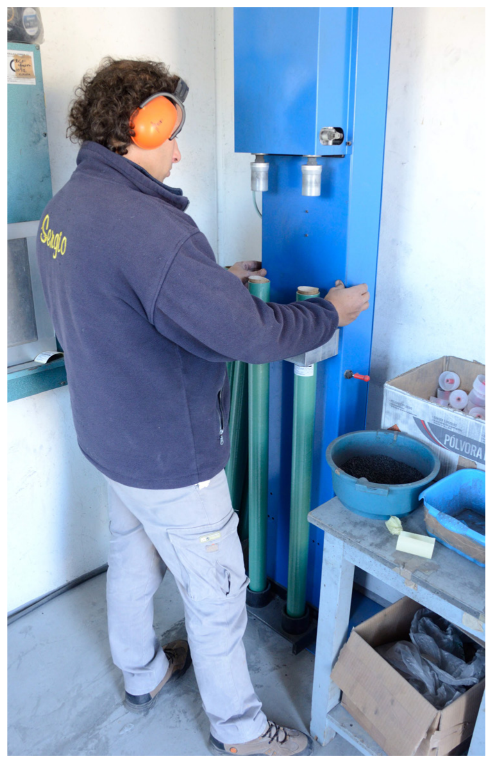
We continued our tour around the factory facility and entered a section where 9 production bunkers had been built. This was part of the factory where CE qualified fireworks were being produced, like spherical and cylindrical shells, stars which are used in single shots and shells, Roman candles and “truenos” (Spanish crackers) in various sizes for mascleta lines. As Jorge showed us each bunker section by section, he carefully explained what specific activity was being accomplished in each one. →

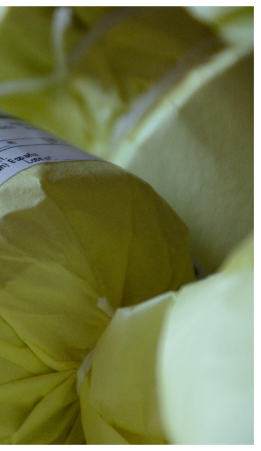
Hermanos Caballer

& FALLAS DE VALENCIA 2016









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For example, in the first bunker we entered, the bombettes for Roman candles were being prepared (in this particular case, for 50mm candles). After the batch was finished, it then moved on to the next production bunker. In the 2nd bunker the candle press was operated and it filled candles with the newly produced bombettes.

Out of all of the bunkers we visited, our personal favorite was probably the bunker where approximately 250 plastic single shot tubes were being refilled. It was fascinating to watch as precisely measured amounts of lift-charge was added to each tube, including the thick disk-shaped, kamuro tail stars and multicolored "round star" mines.

Our final destination was a brisk walk away up to the storage bunkers. Since our factory visit took place March 1st and Fallas de Valencia officially starts March 1st, obviously the bunkers were completely packed with fireworks. In this case, the first bunker was packed tightly with 200mm diameter shells. In the next bunker, prepared mainly for the castillos on March 17th, there were a combination of 125mm shells and 175mm shells. The mix of candles and single shots for the castillos were certain to be a big hit this year. In addition to the castillos, Hermanos Caballer also was scheduled to fire approximately 40 mascletas during the Fallas de Valencia. As we entered the next storage bunker, we saw several kilometers of mascletas lines carefully laid out and knew that everyone attending the Fallas de Valencia in 2016 was in for a treat.

As we can attest to firsthand, the new Hermanos Caballer factory is a top quality professional production facility designed to produce CE certified products—handcrafted products that are carefully and methodically produced by very skilled workers. In addition to production, Jose Vincente Caballer Villacañas and Jorge Caballer Villacañas also focus on something equally important: making certain that traditional Valencian mascletas and castillos continue to be fired throughout all of Spain.

We would like to sincerely thank both Caballers for taking the time to talk to us (and also for amusing us during our tour) and for showing us around their exceptionally interesting facility. We are certainly looking forward to their Fallas production during this year's Fallas de Valencia. ■

Ricardo Caballer, SA (Ricasa)

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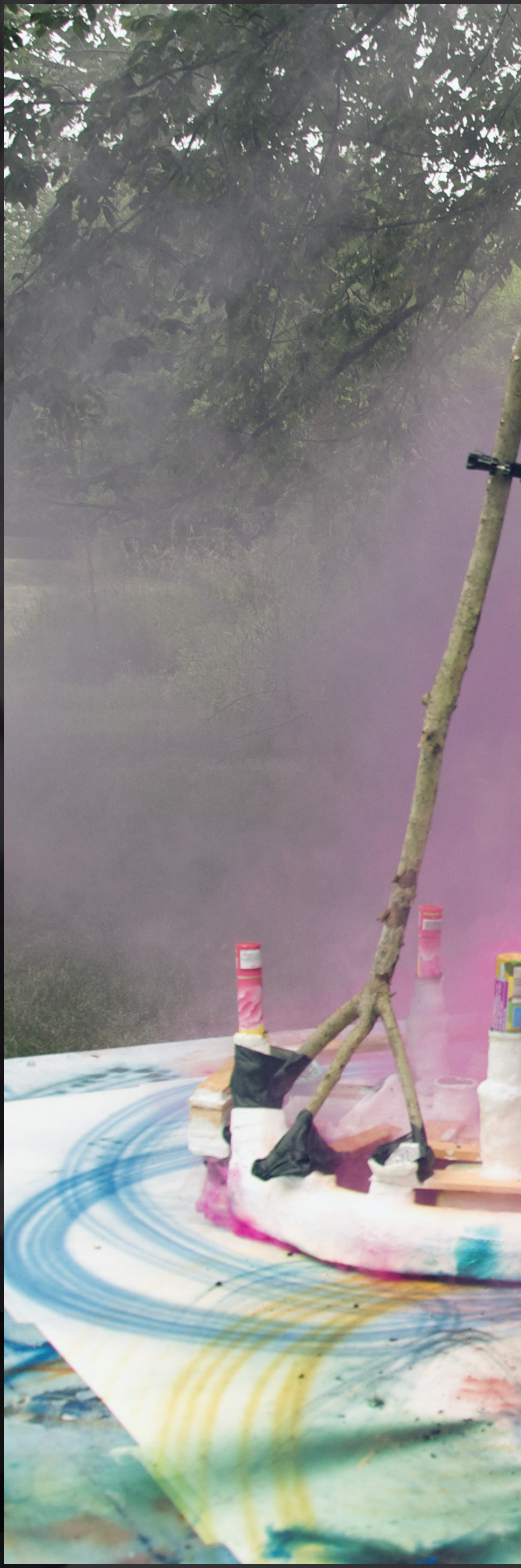
In the Manner of Smoke:
THE ARTWORK OF Rosemarie Fiore

Written by Michael Richards

When I first wrote about Rosemarie Fiore back in 2009, she was just beginning to make her mark as an innovative, groundbreaking artist. As the editor of '76 Pyro magazine back then, I genuinely loved her beautiful firework abstractions, and the circles and lines she was able to induce with smoke and explosives. To put it in the simplest of terms, she created some great stuff, and our readers—judging from the emails we received—loved her work, too. Several times over the next few years I saw where her artwork had been cut out of our magazine and pinned on the walls of pyrotechnician's workshops. →



Smoke Painting Documentation,
Art OMI, Ghent, NY, 2012
Color smoke firework residue on paper,
Smoke Painting
Tool: Sting Ray
Courtesy of Rosemarie Fiore Studio and Art OMI
Photo credit: Ross Willows

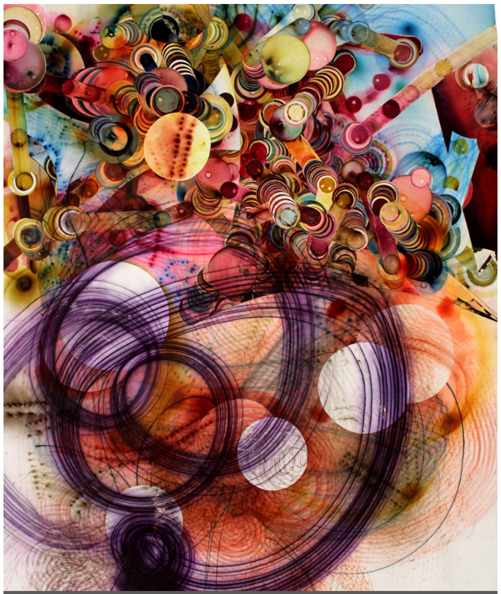
THE ARTWORK OF

Rosemarie Fiore

Rosemarie Fiore was born in 1972 in Mount Kisco, New York. She currently resides in the Bronx, New York where she has her studio. She received her M.F.A. from The School of the Art Institute of Chicago, and her B.A. form the University of Virginia in Charlottesville. In addition, she's attended residencies at Art Omi International Artists Residency Program, Yaddo, Skowhegan, The MacDowell Colony, Roswell Foundation AIR Program, Saltonstall Foundation AIR Program, Virginia Center for the Creative Arts, and the Bronx Museum (AIM Program).

Fiore has exhibited her work both nationally and internationally, and she's racked up an impressive list of awards granted through The New York Foundation for the Arts, The New York State Council for the Arts, The Sally and Milton Avery Foundation, The Marie Walsh Sharpe Foundation, The Lower East Side Print Shop, NY and The Dieu Donne Paper Mill, NY. She has also had solo and group exhibitions that include The SCAD Museum of Art, Savannah, GA, SCAD Atlanta; Von Lintel Gallery, NY; Winkleman Gallery, NY; The Anderson Gallery VCUarts, Richmond, VA; Grand Arts, Kansas City; The Bronx Museum, NY; Weatherspoon Art Museum, NC; The Queens Museum, NY; Socrates Sculpture Park, NY; The Roswell Museum, NM and The Franklin Institute of Science, Philadelphia.

Von Lintel Gallery in New York currently represents Rosemarie. Her work has been reviewed by The New York Times, New York Magazine, Art in America, Artforum, The Village Voice, NY Arts Magazine, FLAUNT Magazine, Art Papers Magazine, The Washington Post, Art on Paper and even '76 Pyro Magazine. Now she'll be able to add Pyrotechnic Magazine to her list, too, which just might be more important since our readers definitely understand what fireworks are all about!



Smoke Painting #40, 2015
Color smoke fireworks residue on paper
63 X 76 in. (160 x 193 cm.)
Courtesy of Rosemarie Fiore Studio

Rosemarie first became interested in using fireworks as an artistic medium when she dropped a smoke bomb onto the ground and liked the marks it left in the street. This inspiring moment spurred an entire new art form in her mind. In fact, although she is not the only individual artist experimenting with fireworks and colored smoke, you could say she is part of growing new genre of art I'm going to label "pyrotechnic abstraction." (Take that, New York Times). Rosemarie says it is more like "fumage," however, which is a surrealist technique where impressions are made using the smoke of candles or kerosene lamps on paper. Salvado Dali called a similar technique he used, "sfumato" which is derived from the Italian words for smoke and blurred. Regardless of what you call it, or where the technique derived, Rosemarie Fiore's large-scale compositions are simply beautiful to behold. There is an aggressive delicacy to her work; a kind of pyrotechnic inspired spirituality. I don't know whether it is the broad swaths of color she intersperses with recognizable shapes and forms, or the geometrical elements combined with smoke-induced color gradations, all I know is that I love looking at the explosive motif she creates on paper.

Smoke Painting #41, 2015 >>>
Color smoke fireworks residue on paper
63 X 76 in. (160 x 193 cm.)
Courtesy of Rosemarie Fiore Studio

For me, personally, her work is reminiscent of Wassily Kadinsky. She may disagree, but I find the same innate balance in her paintings, the same inherent harmony and inner resonance. You can stand in front of a Kadinsky painting and immediately sense the structural balance amidst the

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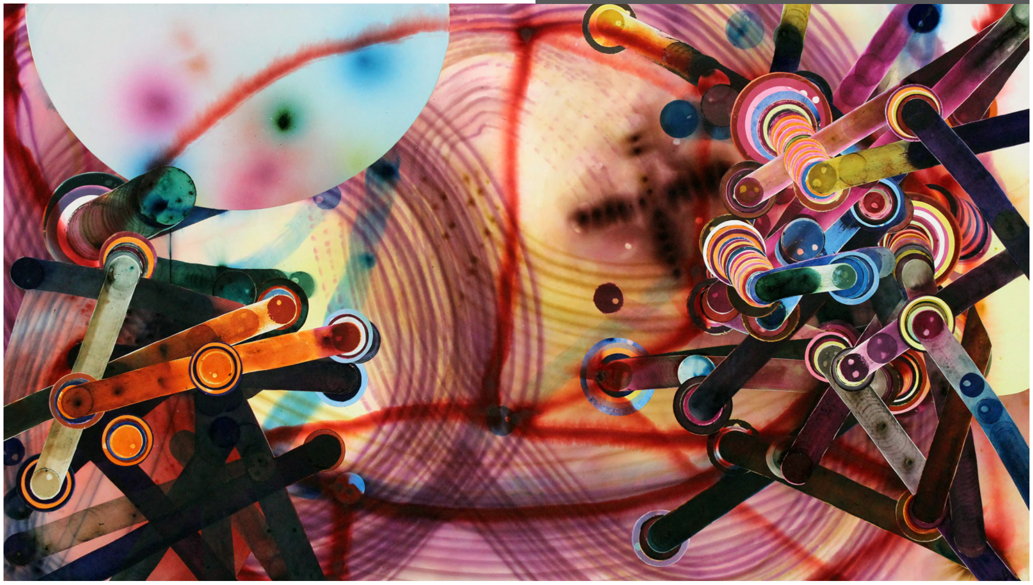
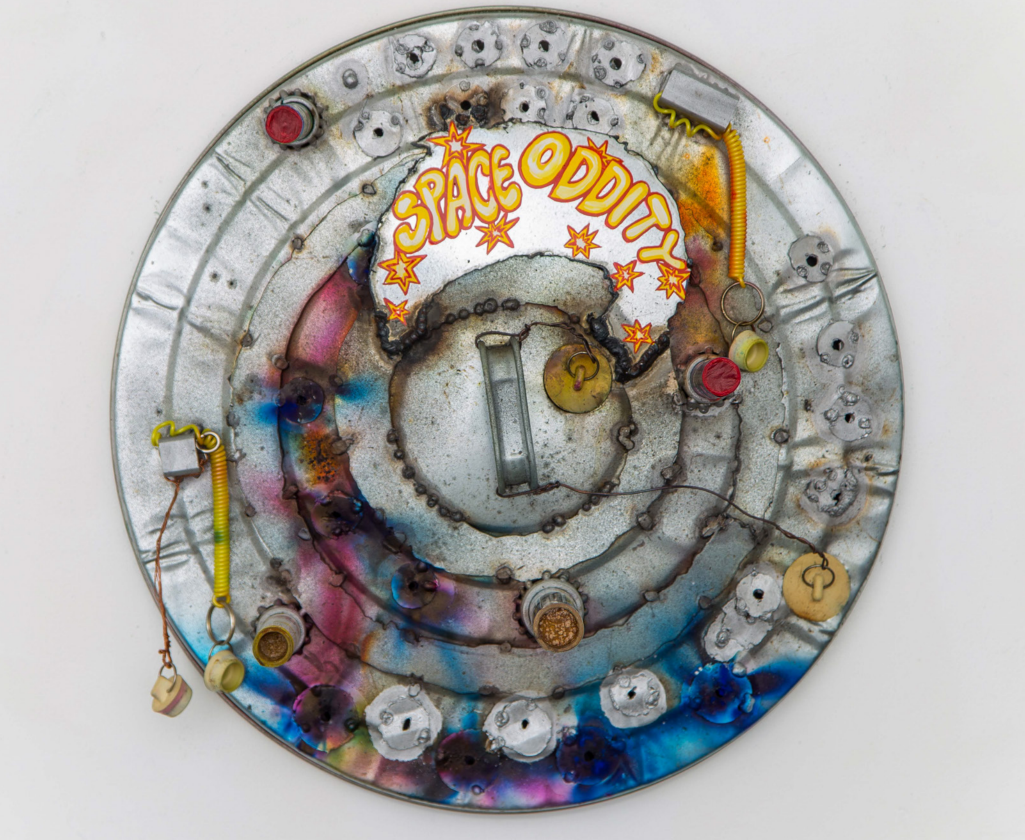
Smoke Painting #36, 2013
Color smoke fireworks residue on paper
40 1/4 x 72 1/4 in. (102 x 183.5 cm.)
Courtesy of Rosemarie Fiore Studio



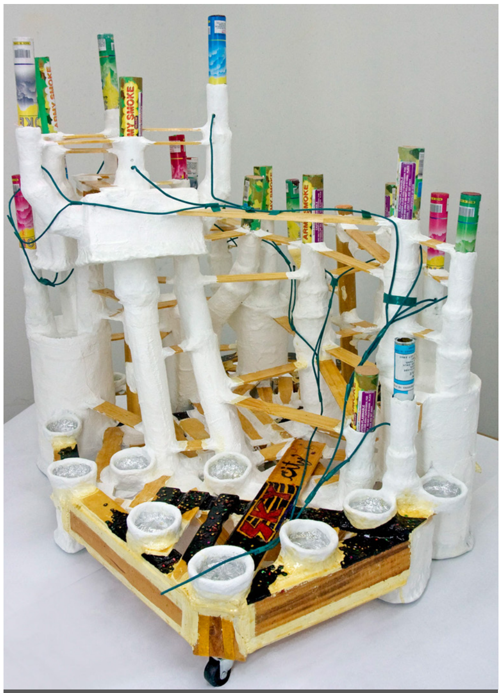
THE ARTWORK OF Rosemarie Fiore



Smoke Eclipse Tool: Space Oddity, 2015
Altered steel trash can, enamel paint
21 x 21 x 4 in. (53 x 53 x 10 cm.)
Courtesy of Rosemarie Fiore Studio

chaos. I get the same feeling when I look at her work, the same sense of harmonic tones and congruity. I like it that she describes her process as a "meditative dance on top of the paper, carried out in silence." I like it because her work evolves in layers. She doesn't just "do it" and she's done. There's a rhythmic choreography involved that creates and changes and metamorphoses into a finished work.

What I find the most fascinating about Rosemarie's artwork has little or nothing to do with the art pieces she creates (although like I said, I love her work) it is the machinery she has devised to create the artwork. Of course, I've only seen pictures of her marvelous contrivances, but since you obviously can't use brushes to paint with smoke bombs, you have to develop something that will focus the color on paper and give you a modicum of control amidst volatile combustible spatter. And in addition to these ingenious mechanisms, she may enlist anything and everything else to satisfy her hunger to create art. It may be a waffle iron, windshield wipers, pinball machines, pyrotechnic debris, an old air freshener or even a section from an old amusement park ride. She constantly pushes her own envelope and forces herself to cross the line to experiment with a host of new ideas—ideas that may center on experimental photography, video or combine all her ideas into one multi-media sculpture.



Smoke Painting Tool: Sky City, 2013
Mixed media
26 x 36 x 36 in. (66 x 91.5 x 91.5 cm.)
Courtesy of Rosemarie Fiore Studio

We had the opportunity to ask Rosemarie Fiore a few questions recently about her life, her creative process and her artwork:

Smoke Eclipse Tool: Fire Star, 2015 >>>
Altered steel trash can, enamel paint
20 ½ x 20 ½ x 27 ½ in. (52 x 52 x 70 cm.)
Courtesy of Rosemarie Fiore Studio

PM: Why put your studio in the Bronx? After all, you were born in Mt. Kisco, which is an awfully pretty little place and only about a 50-mile drive from New York City (where you've worked before). What is the appeal of the Bronx? Is there an art community there we are unaware of? Cheap warehouse space? What?

FIORE: Yes, I was born in Mt. Kisco, but my studio is located in the Bronx where I live and work now. I've had studios in Red Hook, Brooklyn, Long Island City, Queens, Tribeca and the Lower East Side. My family was originally from the Bronx so I moved back there 10 years ago. Initially, right after graduate school, I rented some temporary studio spaces with friends but was awarded some great workspace through one of New York City's non-profit organizations, Sharpe-Walentas Studio Program. As time went on, I found it was optimal to set up my studio exactly how it needed to be for the type of work I planned, so I moved to back to the Bronx where there is much more space for a lot less money. The studio setup I have now allows for greater flexibility and has an outdoors work area that is wonderfully hassle free.

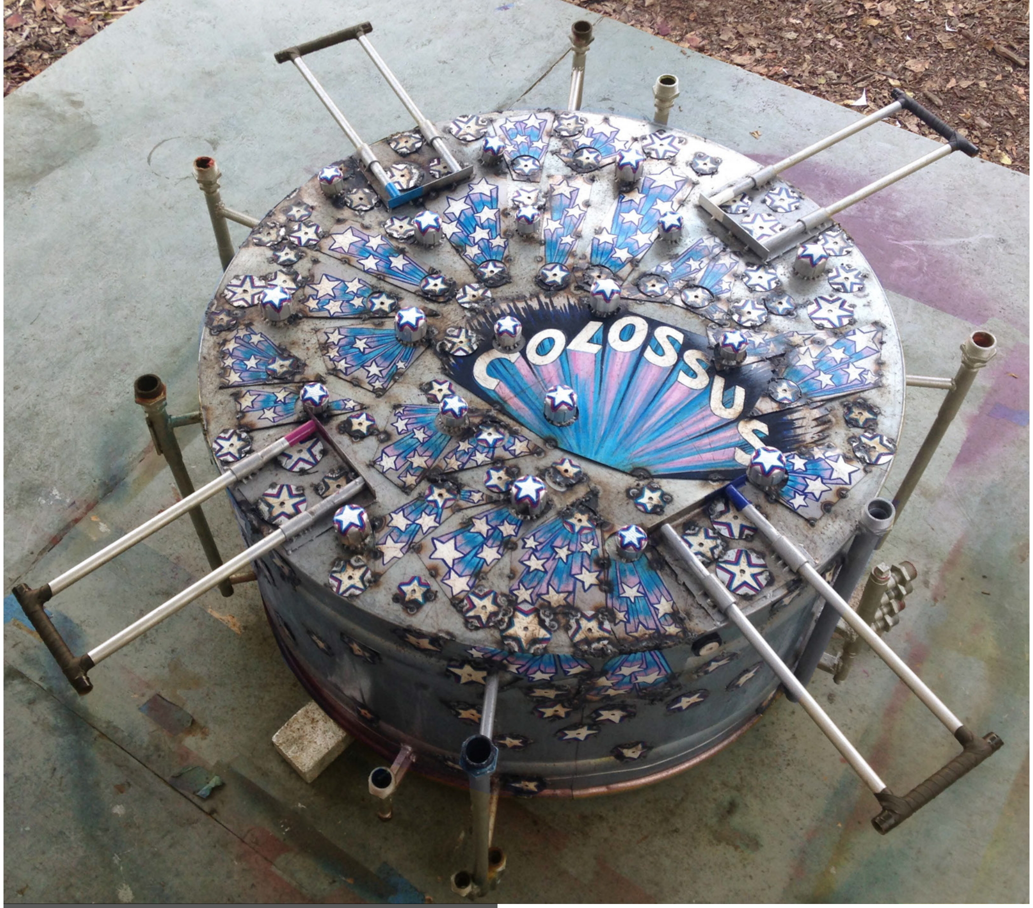
→

THE ARTWORK OF Rosemarie Fiore

PM: What fascinates me most about your artwork—almost as much as the body of work itself— are the numerous gadgets/tools you've devised to create the patterns, shapes, and to spread the colors. Do you have a MacGyver-like mind, or are you mechanical inventions born strictly out of necessity? Which device or devices are you the most proud of creating? Do you have a favorite gadget in your arsenal?

FIORE: I've been working with smoke now for over fifteen years. From day one I found myself developing my own tools because they are necessary to help direct the colored smoke downward onto a surface. Since smoke naturally floats upward and the burning process generates some heat, my initial challenge was two-fold: finding tool materials that were heat resistant and discovering forms that made good containers. At first, I used 'found objects' such as metal cans and buckets as tools. With them, I would contain the lit firework on paper and then cut out the explosions, layering and gluing them together to create a thickly collaged abstract image. I soon began attaching smoke canisters to broom sticks using 2 x 4's to guide my lines as I drew over my pieces.

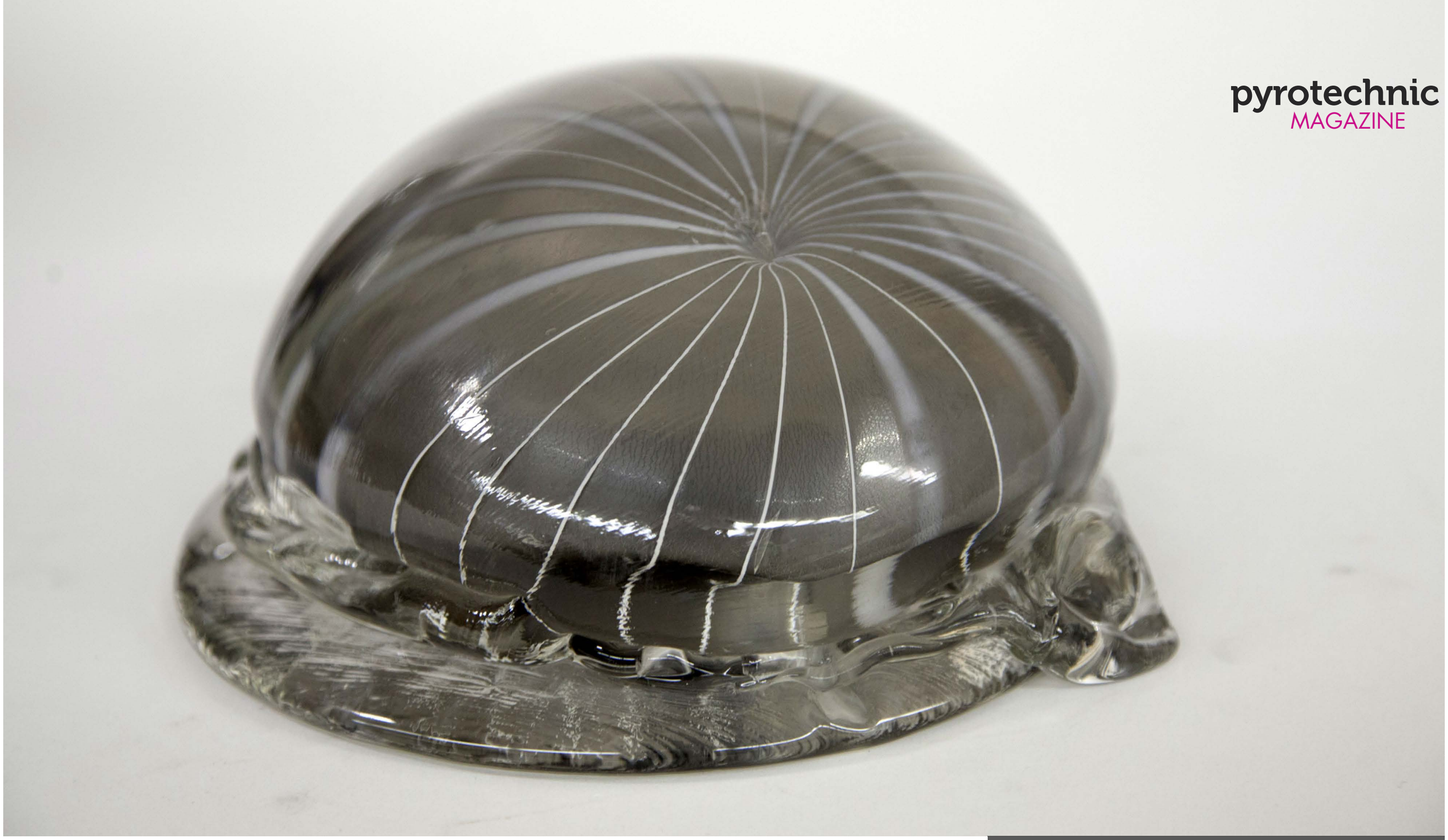
About 4 years ago I stumbled upon an image of the 'Green Man holding a Fire Club' in John Bate's, The Mysteries of Nature and Art, 1634. I realized that the 'Green Man's Fire Club' was similar in design to the simple smoke painting tools (smoke canisters attached to broom sticks) I had been dragging across my pieces. I wondered if I could create more complex tools related in concept to the fire club and if they would aid me in creating different effects, designs and marks. I had an opportunity to explore these ideas during the summer of 2012, when I was working up in Ghent, NY at Art OMI International Artist Residency. There I developed many tool prototypes using wood, plaster and resin. Some of the tools were hand-held, some were pushed, while others twirled on wheels. The tool designs were based on function and purpose. With each new tool, I tried to achieve specific effects with the smoke. More recently, I've been working mostly in steel with trashcans and trashcan lids. I'm pretty excited about the new tool "Colossus" that I've created for my exhibition at the Weatherspoon Museum in North Carolina. It's a 4 ft. diameter galvanized livestock water trough that I transformed into a 'Smoke Painting' tool with the help of the MFA students at the UNC Greensboro department of Art. It takes 4 people to work and creates large images on 5 x 5 ft. paper. The tool itself and the paintings created with it will be on display at the museum through April 17, 2016.



Smoke Eclipse Tool: Colossus, 2015
Steel and enamel paint
69 inches (175 cm.) in diameter
Courtesy of Rosemarie Fiore Studio

PM: There are several other artists worldwide who create beautiful artwork using a variety of fireworks as their artistic catalyst. David Sena, for example, who we interviewed and wrote about in Pyrotechnic Magazine issue #6. He does amazing work by exploding firecrackers to create burn marks directly onto paper. Cai Guo-Qiang, the exceptional Chinese artist who worked with Phil Grucci during the Olympics, also creates elaborate art pieces using burns, colored smoke and controlled explosions. When I look at your work, Wassily Kandinsky immediately comes to mind. Are you simply experimenting or attempting to solidify "fumage" as a permanent gallery category? Also, is there a difference between "fumage" and "sfumato"?

FIORE: As an artist, I am always experimenting. Part of the reason why I make art is to expand my understanding of a technique or an idea. Once I understand the limits of a process, I try to take it further. I am influenced by many artists, Kandinsky is just one of them, as well as 'Abstract Expressionists' such as Pollack and Yves Klein, to name a few on a very long list. Early on in my career, I was very interested in 'Automatism.' Automatism is a method of creative production developed by the



Smoke Dome #5, 2012
Glass blown with firework smoke
10 x 9 x 6 in. (25 x 23 x 25 cm.)
Courtesy of Rosemarie Fiore Studio

Surrealists in which there is no conscious self-censorship. For example, the artist might paint with the flame of a candle (fumage), create surface rubbings (frottage) or randomly draw. Chance and accident are embraced and movement, mark or line is not consciously directed. I experimented with Automatism by removing my hand from the work and replacing it with machines that acted as ready-made paintbrushes. I created paintings using the windshield wiper of my car, the brush of the floor buffer and blade of the lawn mower. The machines painted chaotically and somewhat randomly with little guidance.

PM: What led you to colored smoke?
FIORE: I became interested in color smoke fireworks when I was living in New Mexico in 2001 and 2002 when I was there on a fellowship supported by the Anderson Museum of Contemporary Art. Having arrived in Roswell, the home of Robert H. Goddard's early liquid-fueled rocket experiments (many of which are on permanent exhibit at the museum), I initially became interested in creating paintings using rockets. I eventually gravitated more toward experimenting with consumer fireworks as paintbrush tools and got interesting results from working with smoke bombs and smoke canisters. One 4th of July, I lit a blue smoke ball and it accidently dropped onto the concrete. I was intrigued as it rolled and created a perfect arched blue dotted line. I discovered I had found a way to paint with smoke and grabbed a piece of paper. I then began to develop my fumage technique.

PM: So, your technique is more 'fumage' and not 'sfumato'?
FIORE: Popularized by the Austrian Surrealist Wolfgang Paalen, the fumage technique defines a work on canvas or paper that features marks left by a candle or kerosene lamp. Salvador Dalí utilized the technique in his paintings, and called it "sfumato". He co-opted the Italian word “sfumato” which is used to describe an oil painting technique in which paint (with no smoke involved) is applied so that the image appears smoke-like or vague and blurred. Leonard Da Vinci is famous for this technique. The fumage technique I have developed I call Smoke Painting. No gunpowder is involved. When the formula is burned, pressure is created and the dye and pigments are forced out of the canister where they condense and hang in the atmosphere. As an artist, I intervene at the exact moment the dyes and pigments exit the canister. By capturing the smoke in tools that act as containers of various sizes, I am able to direct the smoke onto paper. I must act quickly because once the smoke leaves the surface and floats upwards, I have lost the color as it quickly disperses into the air.

PM: Most of your pyrotechnic work to this point has been predominantly two-dimensional using colors, shapes and lines on paper. I noticed, however, that you have also delved into three-dimensional pieces like “Smoke Paintings: Sky city” that place smoke patterns you've created behind as 3-dimensional structure. Is this somewhat new for you? Is this the next logical step, or simply more experimentation? Are you looking for a way to tie all of your expressive work done in oil, ceramics and video into one complete form for yourself?
FIORE: The Smoke Painting tools aren't the only attempt I've made at working three dimensionally. In 2011 and 2012 I created

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THE ARTWORK OF
Rosemarie Fiore

sculptural work that spoke about the form of smoke. I researched various casting methods that would enable me to cast the firework's smoke plume. I eventually ended up developing a technique under the guidance of Hotsand Glassblowing Studio in Asbury Park, New Jersey, where I used smoke bombs to blow glass. During the creation of these works, I embedded the smoke bombs into the molten glass in order to capture the breath of the firework inside a glass form. The form of the work was determined by the time it took for the firework to release its smoke and the time it took for the molten glass to harden. These works are called Smoke Domes. I later took this technique to VCU in Richmond, Virginia to work with Jack Wax and his glass students in their 'Hot Shop' facility. We developed and refined the technique I was using, and I exhibited a few from the series at the Anderson Gallery in Richmond.

PM: Is that when you created your amazing 'Sky City' machine?

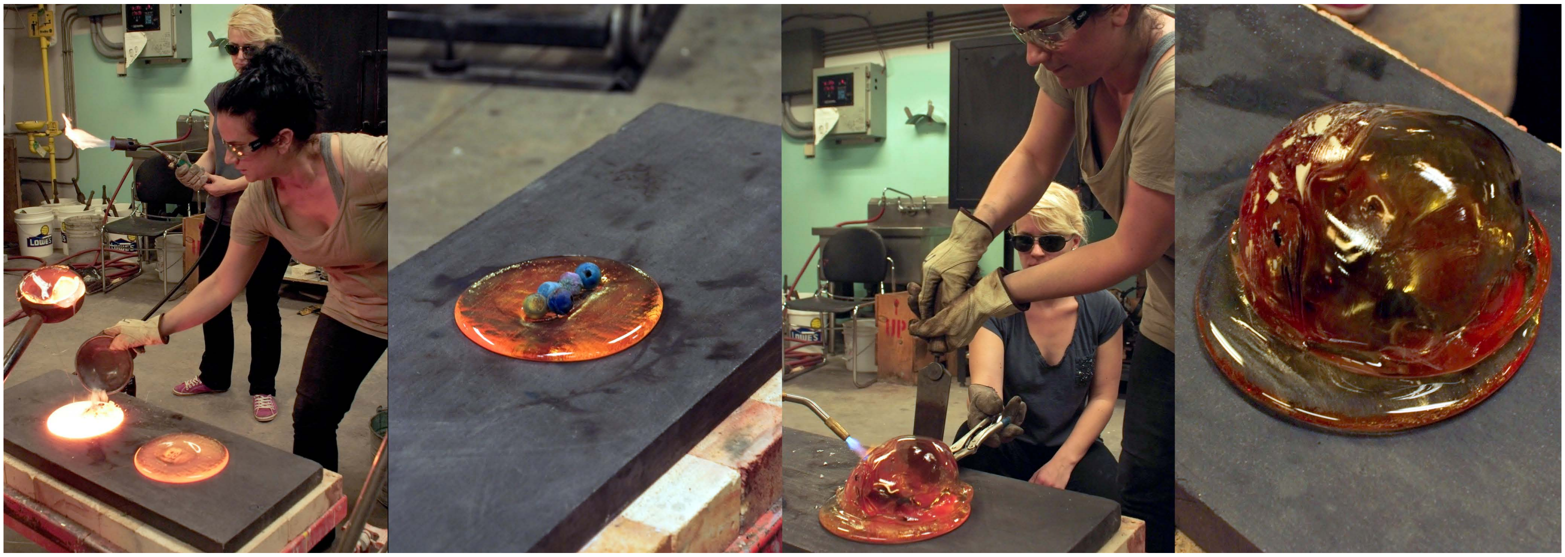
FIORE: After I developed my moving and spinning Smoke Painting tools in 2012, I took the new tool designs back to my Bronx studio. It was there I created Sky City. This large tool actually takes 3 people to operate. The 30 plus smoke canisters are fitted into the top of the tool and their fuses are tied together connecting them. When lit, pressure shoots the colored smoke out of the chambers onto the paper through the series of hole designs pierced into the bottom of the containers. The tool itself is moved with poles. As each section spins, they create large interwoven swirling patterns. Over time, the tools become clogged, chipped and broken, so I am constantly in construction, repairing, adding and taking away parts.

Presently, I am working on a series of metal tools (of which Colossus is the largest) that I developed last year in Utica, NY using the sculpture facilities at Sculpture Space. There, I altered trashcans and lids and created new tools to work with.

PM: Unlike other fields, the art world seems more like an unpredictable living, breathing creature. Just when you think you've got a handle on almost every facet imaginable, something new pops up that startles and re-energizes art as we know it. Fifty years ago, who would have predicted that artists would someday be using explosives and colored smoke exclusively to create Modern art. So, what are your predictions? What path do you see your own artwork taking as your techniques logically mature and you gain even greater control over your media? And what are your predictions about artwork in general? What kinds of artwork do you think will manifest itself into the next century?

FIORE: I would guess that work using new materials and technology will continue to be very popular into the next century. Technology like 3-D printing seems upcoming and interesting, but who knows what techniques and materials will be available for artists to experiment with in the future. Whether its sculpture, painting, video or whatever is next, one thing is certain—engaging artwork always rises to the top. ■

Rosemarie Fiore is currently represented by Von Lintel Gallery in Los Angeles.
To see more of her work visit:
www.rosemariefiore.com
You can contact the artist at the following email address:
rosemarie_fiore@yahoo.com



Piroshow

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PROFESSIONAL ARTISTIC SOLUTIONS

Written by Salvatore Bonfiglio - B3Studio Ragusa

The system

Compared to the traditional firing method, electronic firing systems offer the pyrotechnician a quantity of advantages in terms of precision, reliability and security. The truth is they have become almost a requirement for any company operating in today's fireworks industry Additionally, this electronic firing technology allows you to plan, organize and perform exceptionally complex shows using a wealth of choreography and implementations that previously would have been categorically impossible.

We feel Piroshow is a professional firing system that sets new standards of excellence in the planning and execution of pyrotechnical displays. Piroshow has been designed to provide pyrotechnic companies with a complete and articulated system of products that can help compensate for any need that may arise during design, installation, grounding and/or execution of any type of fireworks.

In short, if you're a pyrotechnician, we feel the Piroshow firing system should definitely be your system of choice.

The Piroshow system originated primarily out of requests made during our daily dealings with pyrotechnic companies facing a myriad of difficult problems in the field. All our modules and tools have been conceived, designed and manufactured specifically to ensure the highest quality and dependability.

For companies planning to convert their current traditional firing system to an electronic firing system, or from an unsophisticated firing system to a more professional one, it is important to keep the following in mind: purchase a system that is ultimately reliable and will enrich the production of your displays.

Piroshow was designed to be exceptionally reliable in the field and intuitive to use.

Requirements

Hi fidelity: All of the electronic technology used in Piroshow was developed directly by our company so we could guarantee its unmatched accuracy and steadfast dependability. Duration: All Piroshow products are designed to last. We use only heavy-duty materials in their construction and make certain they are water resistant as well. Fact: all Piroshow products carefully follow strict international guidelines.

Simplicity: Our modules have an intuitive operating system, and we provide detailed guides that fully explain all operation modes. Weight: Piroshow takes full advantage of state-of-the-art microelectronics and leads the way in this area. Our modules are far more compact and weigh less than our competitors, making transportation, loading and unloading is much easier.

Reliability: When properly used and maintained, all of our products are guaranteed to work perfectly. We affirm Piroshow will work perfectly even after years of use in the most adverse weather conditions.

Accuracy: Piroshow ensures perfection in all synchronization activities and precision in ignitions up to a hundredth of a second.

Completeness: The Piroshow system is a complete system of modules, tools and accessories, rigorously designed to meet EVERY REQUIREMENT a pyrotechnician might find necessary during the planning and/or execution of a fireworks display.

Modularity and Flexibility: All Piroshow system products are compatible with one another. This makes it possible to create an ever-expanding modular system of ignition products that can be combined to produce enormous shows in almost any environment. And because they are a truly modular system, their inherent flexibility makes it possible to manage a wide variety of shows—even if they are on the same date.

→

Master Full
THE MONSTER

Master Full is the flagship module of the Piroshow system, and a significant entry into the world of professional electronic firing systems. Master Full is the first module that allows a pyrotechnician to actually control all primary and collateral operations of a firework's show using a single tool. This makes much better execution possible and makes it easier to recognize potential errors during a show's preparation and assembly. Obviously, having the capability to see and solve potential errors immediately before they occur has a host of benefits (the safety of your team members, for one). But there is also a great deal of time saved and cost savings as well.

Since its introduction, Master Full has been given the endearing moniker of "The Monster" by some of the people who use it. We think it has something to do with its seemingly infinite number of functions.

Master Full isn't really an expense as much as it is an investment in potential. In short, Master Full allows you to turn fireworks into true pyrotechnic art. It makes it possible to create shows that previously could only be dreamed about.

Master Full makes it possible to:

- Import (via USB key) shows designed on the simulator.
- Create a show directly through its simple interface.
- Save shows (created or imported) into its 16GB internal memory, making it possible to save thousands of shows.
- Edit all shows (either in memory or imported) according to the needs of a specific show.
- Export shows from internal memory to a USB key and/or transfer them to another Master Full system or PC.

Pyromusicals

Master Full allows the pyrotechnician to have complete control over the entire workflow related to pyromusical fireworks production and to their implementation. With this system you can:

- Import a soundtrack
- Import or create a firing list
- Sync directly on the Master
- Run a pyromusical (both fireworks controls and music) through audio outputs

Lights, Flames and Scenic Effects

Master Full recognizes and manages the DMX protocol. That way you can enhance the fireworks or pyromusical with lights, flames or other scenic effect compatible with the protocol. You can also:

- Import lists of stage effects designed on the simulator
- Create lists of stage effects directly on the Master Full device through the same interface used for creating fireworks (very easy to do!).
- Insert stage effects already stored into a current show list
- Integrate running of the entire show

Obviously, the management of stage effects may be used independently of the pyrotechnic contexts, thereby expanding the business work areas.

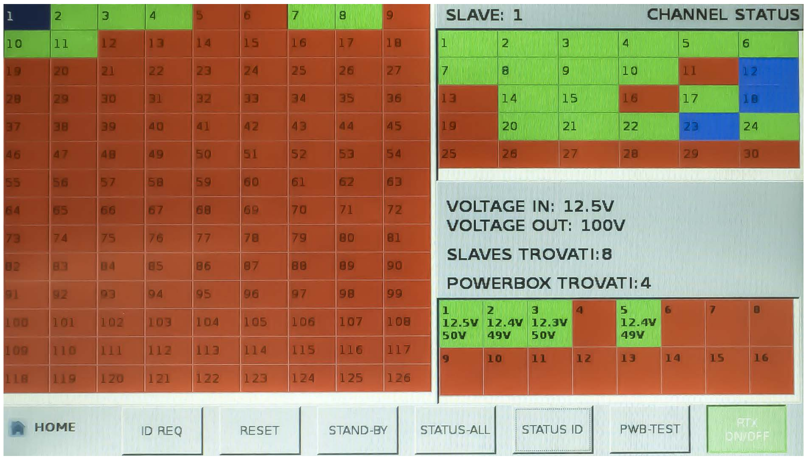
Show Simulation

In the case of traditional fireworks, pyromusicals, and shows with scenic effects, once the wiring and grounding are completed you may simulate the final show. This simulation may be viewed with both its music and lights in order to check its complete operation, and to synchronize it with the firing list (step-by-step on the large Master Full screen).

Tests

Besides routinely testing the unit's internal battery charge status, Master Full also carries out a complete test of every module used in the show.
In addition, the unit:

- Checks ID status: identifies all modules properly connected (wired or wireless) to Master Full.
- Performs online testing: looks to recognize the correct insertion of igniters in each channel of the firing modules.



1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117
118	119	120	121	122	123	124	125	126

SLAVE: 1 CHANNEL STATUS

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

VOLTAGE IN: 12.5V
VOLTAGE OUT: 100V

SLAVES TROVATI:8

POWERBOX TROVATI:4

1 12.5V 50V	2 12.4V 49V	3 12.3V 50V	4	5 12.4V 49V	6	7	8
9	10	11	12	13	14	15	16

Note: During both the Status ID Check and Online Check the display onscreen uses specific color-coding information allowing the pyrotechnician to readily view and solve wiring or individual igniter malfunctions. Color-coding like this also helps identify any errors in the connections to a specific single channel (e.g., "ch19 yes - ch20 no" vs. "ch19 no - ch20 yes"). Whether the connections are done using a cable or a radio modem, the total time to perform a complete test of 126 firing modules takes approximately 4 minutes. A single Slave test takes approximately 1 second to complete.

Incredible as it may seem, any test can be performed while an individual show is running. In case a minor accident occurs, the pyrotechnician running the display can immediately decide whether to cancel the show (or only troubled portions of the show) to protect the safety of the team and general the public.

→

FIRE!

Master Full mode control:

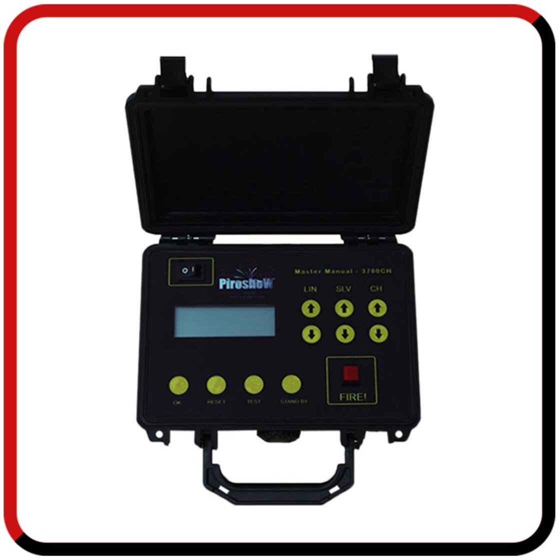
- In Standard mode: up to 126 firing modules/3780 cues.
- In EXTENDED mode: UNLIMITED firing modules.

The bottom line is, by using Master Full, any kind of show—even an incredibly large show—can be run from a single location!

And the execution of a show can be done in:

- Automatic mode
- Semi automatic mode
- Manual mode (Note: You can switch from automatic to semi-automatic mode at any time).

Master Full also allows for the simultaneous use of two firing modes: automatic/semiautomatic and manual. As far as we know, this possibility is an exclusive Piroshow feature. It offers the pyrotechnician the option to manage their shows according to rapidly changing criteria and makes it possible to run entire sections of a show according to a pre-programmed base.



Master Manual
THE LITTLE GENIUS

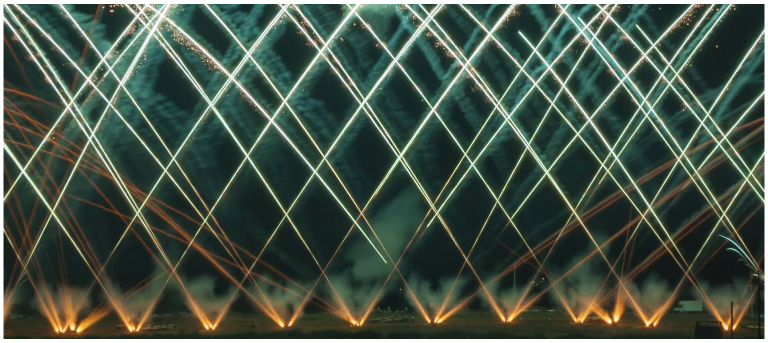
The Master Manual could be considered **"the little genius"** of the Piroshow family. Small, compact, lightweight, the Master Manual was created to manage fireworks fast and easy in manual mode.

Master Manual requires no programming, and after wiring operations are completed, you only need to select the first ignition channel and press "FIRE" to start the show.

Its simplicity, of course, masks the internal highest technological capability of this unit.

Its electronic heart alone makes it possible to manage up to **126 firing modules** (Slave 30CH 100V or Smart Slave) for a total **3780 single ignitions**! Also included is exclusive **"ghost slave"** technology that allows the system to easily manage large and very large shows with **numerous shooting locations**.

Test functions have also been incorporated into all firing modules, giving the pyrotechnician immediate command of both standby and wake-up.



Slave 30CH 100V

MULTIFUNCTIONAL • SIMPLE • COMPACT

Slave 30CH 100V is a professional firing module ensuring the highest possible precision and reliability coupled with enormous flexibility. Slave 30CH 100V is the crux of the Piroshow system. In fact, it can be connected either to the Master modules in a totally autonomous way, or used as a sequencer module to manage other Slave 30CH 100V modules connected.

Slave 30CH 100V can be used:

- **For firing shows connected to Master** units by wire or by Radio Modem
- **As a sequencer** (each Slave 30CH 100V is equipped with an internal software for the programming of sequential ignitions of constant/accelerated/decelerated/programmed type making it easy the creations of extraordinary choreographic effects).
- **As an independent firing module** used in an autonomous way, or connected to other Slave 30CH modules through individual trigger pulses that can execute various intervals and individual ignitions. They may also be connected to another single channel Slave 30CH with autonomous sequential programming.

There is a full range of tests available for the correct insertion of each igniter and of each sequences simulation. These tests provide instantaneous feedback and make error correction immediate.

The electronic circuits and the internal software (designed exclusively by Piroshow) ensures a **constant firing voltage** of 100V for each of its 30 channels. This makes it possible to connect up to **50 igniters to each channel** and simultaneously execute operations using a single Slave 30CH 100V. (30 channels x 50 igniters = 1500 igniters!)

Individual ignitions have a minimum interval of **0.01 second** between each one. The battery provided is a **long-life battery** (60h stand-by) and it has the ability to manage a power-on and power-off directly from the Master (for "standby" and "wake-up"). To further simplify installation in the field, each unit is **waterproof** as well. It is housed in a case made of ABS (Acrylonitrile-Butadiene-Styrene: an opaque thermoplastic polymer material) with an internal valve managing pressure adjustment. This provides **maximum safety and resistance for even the most intense usage**, even though the unit is compact in size and light to carry.

Radio Modem RTX 500mW

NEVER LOSE SIGNAL

The radio modem RTX-500 mW by Piroshow allows wireless bidirectional communication between all of the modules included in our firing system. Each RTX-500 mW can support the connection of **up to 32 modules simultaneously**, making this unit not only economical, but logistically sound.

The Piroshow radio modem uses **our own proprietary technology that makes a clear, powerful communication signal possible in essentially every possible situation**. With a range of **up to 12 kilometers in an open field** and 1.5-2 kilometers in the presence of buildings, our radio modems are indispensable tools for the execution of large shows with firing positions at great distances from one another.

→

Smart Slave & Power Box

HI TECH • PRACTICAL • EASY

Piroshow's constant use by pyrotechnicians in the field, and the excellent feedback we received from them, helped us create a new firing module alternative to the Slave 30CH 100V. The idea was to meet the specific needs of show designers and create a unit capable of running in automatic or semi-automatic mode. This ultimate goal was reached by eliminating the internal battery and all components in the module not used directly for firing. What we created was an extremely compact, lightweight module that you could even hang up somewhere at your site.

With 30 individual firing channels similar to its counterpart, the Slave 30CH 100V, pyrotechnicians now have essentially the same reference unit they had when they initially programmed the show.

To keep the unit lightweight this unit's power is supplied by an external power unit: the Piroshow "Power Box."

This unit can handle up to 16 Smart Slaves simultaneously (only a single module must be charged prior to a show). Piroshow also guarantees a 50V constant firing voltage, allowing the user to connect up to 25 igniters per channel. (Note: You can test every connected Smart Slave From the Power Box module).

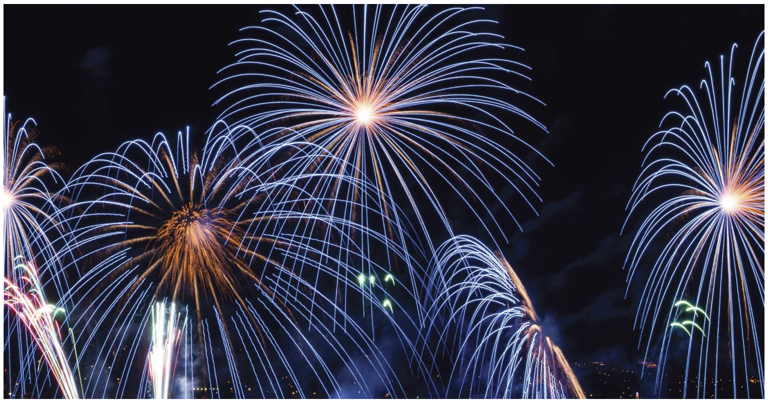
FU.MU. Software + Converter

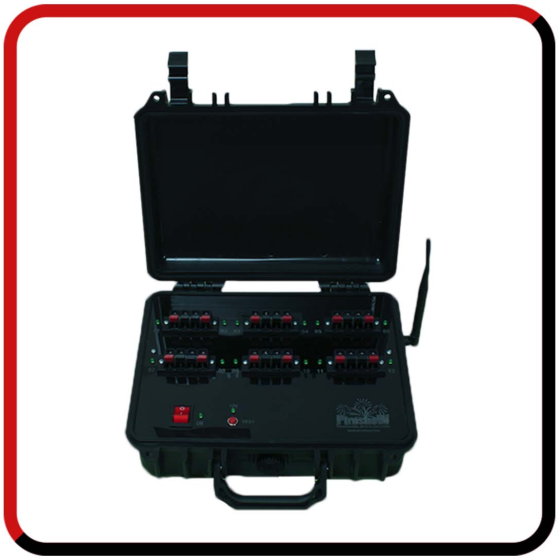
PERFECT SYNCHRONIZATION AND FIRING

Using a PC or any other equipment that functions using the Windows operating system, FU.MU. software and its requisite Converter allows you to **synchronize an audio track directly to a list of pre-programmed ignitions on a pyromusical simulator in automatic or semi-automatic mode.**

Again, the ease of use, the possibility of making immediate changes, the capability of running a show on a tablet or smartphone, makes the combination FU.MU. + Converter the perfect tool for any company creating pyromusicals.

These units are very **versatile and an economical alternative to the Master Full**—especially for companies who occasionally perform multiple shows in different cities on the same day. Similar to the Master modules, these units have the capability to **handle 126 Slaves (3780 individual channels)**, radio communication, as well as testing and simulation for large shows.





Easy Fire

FOR PROFESSIONAL AND AMATEUR

Easy Fire could be considered the baby of the Piroshow firing system. **This unit was designed for small shows and can be used by a single individual to control its management and the ignition.** Easy Fire is perfect for the amateur, but also has enough capability for a professional as well.

Easy Fire has 12 channels for up to **360 total ignitions**, and like our other firing modules, Easy Fire is waterproof. The newest version has an external antenna in a hermetically sealed case that makes it possible to run a show without errors even bad weather conditions.

It shares the same professional tear-proof clamps for the insertion of the igniters that the Slave 30CH 100V module uses, and corresponding LEDs indicate whether or not correct insertion has occurred. The new remote control has a range of up to 2 kilometers so safe distances are always ensured.

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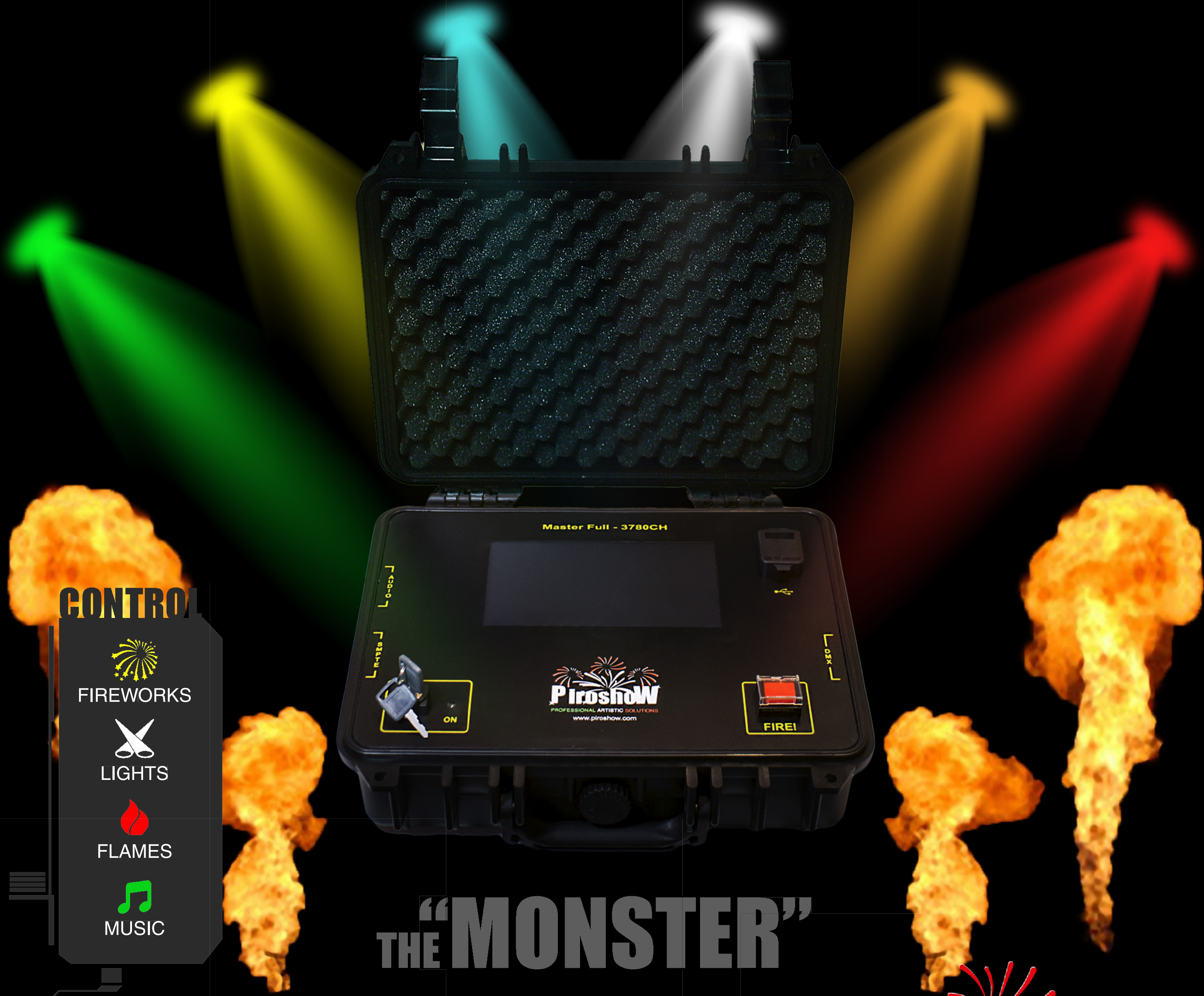
MASTER FULL



CONTROL

- FIREWORKS
- LIGHTS
- FLAMES
- MUSIC

THE "MONSTER"

- EXECUTION MODE : AUTOMATIC, SEMI-AUTOMATIC, MANUAL
- CREATION AND EDITING OF SHOWS DIRECTLY ON BOARD
- ACQUISITION OF AUDIO FILES AND INTEGRATED PYROMUSICAL SYNC
- INTEGRATED MANAGEMENT OF LIGHTS, FLAMES AND OF ANY COMPATIBLE KIND OF SCENIC EFFECTS
- EXECUTION OF SHOWS BY SMPTE (TIME CODE)
- THE MOST COMPLETE LIST OF FUNCTIONALITIES
- 16 GB INTERNAL MEMORY, STORING OF SHOWS

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FIREWORK DISPLAYS

Ten things to avoid doing

Written by Dr Tom Smith

I have been involved with major firework displays since a very young age, my grandfather worked for Brocks Fireworks display teams part time, having been at school with Roy Brock in the early 20th century and I worked with him for many years.

Having worked part time for Kimbolton Fireworks for 10 years and full time for nearly 10 years more and then as an independent consultant working on many of the World's major events and also as an expert witness (and doubtless because of my growing age) I have come across many things which now truly frighten me – either because they are just out of date, plain poor practice, or are as a result of the fundamental misunderstandings of the issues involved. Sadly it is often said that the safest companies are those that have just had a "near miss" – but no-one wants to get into that situation.

So here is my current top 10 list of things not to do! They are necessarily personal observations and are in no particular order. I do sincerely hope that the vast majority of display companies and individual firers reading this would never do such things – but I am realistic! If this short article provokes some into reconsidering the way they do things, to put in place robust procedures to improve safety then it will have been worthwhile upsetting others by appearing to preach.

We've always done it like this

I have heard this so many times and it depresses me that people can be so naive. The problem is every venue changes from event to event and even from day to day. In addition the weather changes for every show (or potentially does) – in particular the wind strength and direction. Even in the most settled and predictable climate there will be exceptional days.

EVERY display plan, irrespective of whether it is a new show, a show on a site previously used, or a repeat show on the same site over, perhaps, several sequential days should consider the following **FOR THE SPECIFIC DISPLAY**:-

1. Where is the firing area to be?
2. Is there any flexibility in its position (eg on a barge) which could have positive or negative implications?
3. Where are the audience, structures (which are being used to fire from or could be impacted by the display), performers, ancillary equipment (eg generators), car parking areas, other hazardous areas (eg flammable things) etc etc?
4. What are the most likely meteorological

→

conditions? (in the UK for instance the wind is predominantly from the South-West and less than 20 kmh-1)

5. What are the worst case conditions?
6. What fireworks are therefore appropriate to the site?
7. What should be removed from the display if conditions change?
8. At what point must the display be cancelled?

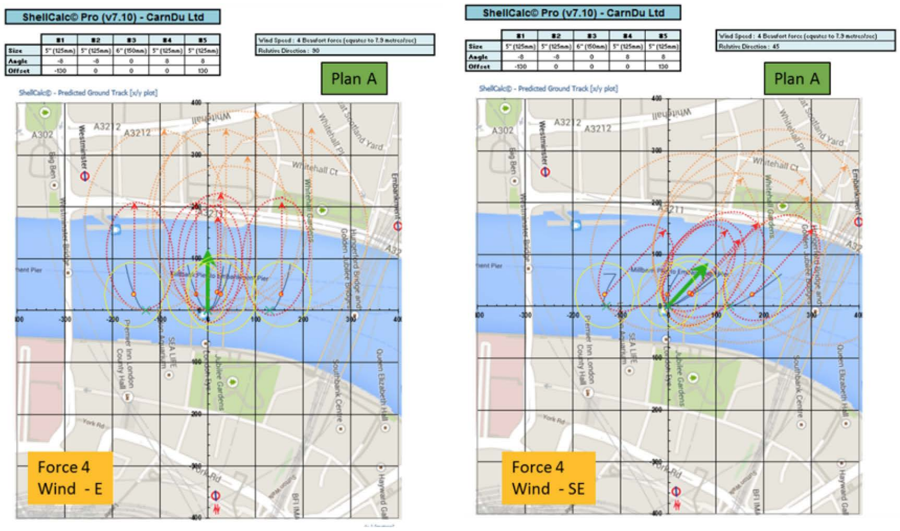
We got away with that one

This is even worse! No-one should ever leave a display and say this – it is an admission that there was not sufficient planning. I have heard display crews say this many times, which is bad enough, but I have heard display designers, display managers and event organisers saying it even more frequently – which is unforgiveable.

Planning is the key to a successful show – both from an aesthetic point of view and from a safety point of view. With time comes experience, and with experience comes an understanding of the potential issues. If you haven't got that experience then you need to develop it – quickly! Seek out best practice, develop rigging and firing methods from working or talking with others – most established companies are not particularly precious about such things, they have long recognised that any incident potentially affects all companies in terms of tighter controls or inspections, or loss of business or the treat of banning displays completely.

You must aim never to be caught out by conditions or the site – it is far better to agree objective criteria for curtailment or cancellation BEFORE the display (and stick to them) than to be pressured into ensuring "the show must go on" even if you are reluctant to do so. If your insurance (as many do) has upper wind strength limits – then say so – otherwise you run the risk of firing a show with, effectively, no insurance – and in the conditions that probably makes an incident more likely.

Over the years we have developed with event organisers and display companies fallout tables that relate to wind speed and direction, firing angles and calibres – and use them to determine these objective criteria. For small shows a simple table used by the display crew is probably best – if the wind gets above this strength, then we don't fire X,Y or Z. For complex shows then a site-specific determination of different wind angles and speeds and the effect on the show (which is probably fired from several positions) is more appropriate and can be justified within the overall planning and within the overall budget. It's not an expensive or overly time consuming exercise – but it does provide sufficient "due diligence" and give everyone (organisers, the display company and the media) clear information on what might have to be removed from the show should the conditions dictate.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Plan A
Force 4
Wind - E
ShellCalc© Pro (v7.10) - CarnDu Ltd
Plan A
Force 4
Wind - SE

Use of Shellcalc© to determine fallout and debris criteria for curtailment or cancellation of a display

Ultimately, and especially for display companies sending out several shows a night, it is important that the display crews make the same decisions as the company boss would on site – after all it will be you, the boss, who ends up in Court having to defend the decisions made by your staff.

This show is different to all the rest

No, No, No…..it really isn't! Event producers all too often think that you should deviate from normal practices for THEIR show. Every display must be planned seriously, every display presents risks, the basic risks remain the same – for instance in dropping lit "normal" debris on the audience, or the (much more severe but thankfully very much less frequent) consequences of a shell landing in the audience through simple product failure or as a result of having been projected at a low angle as the result of, for instance, mortar rack failure.

Obviously the depth and extent of planning may change according to many factors including the following

1. The nature of the event
2. The budget
3. The venue
4. The media interest in the display

but smaller, less complex displays may be able to be planned on the basis of well developed (but relatively pessimistic) appreciation of fallout distances and product failure distances for the materials to be used. Similarly relatively simple curtailment or cancellation procedures may be appropriate for these displays.

At the other end of the scale, the biggest, most complex, highest profile events, there is the opportunity to develop explicit curtailment or cancellation criteria that relate, for instance, to specific wind speeds and directions.

However, as a professional the same standards should be applied to every show – do not allow over-enthusiastic organisers to try and either persuade you to cut corners, nor to do things that you would not be able to defend should an incident occur. Insurers would take a dim view (as would the organisers post any such incident) of you not doing it right.

Shells sitting on mortar racks

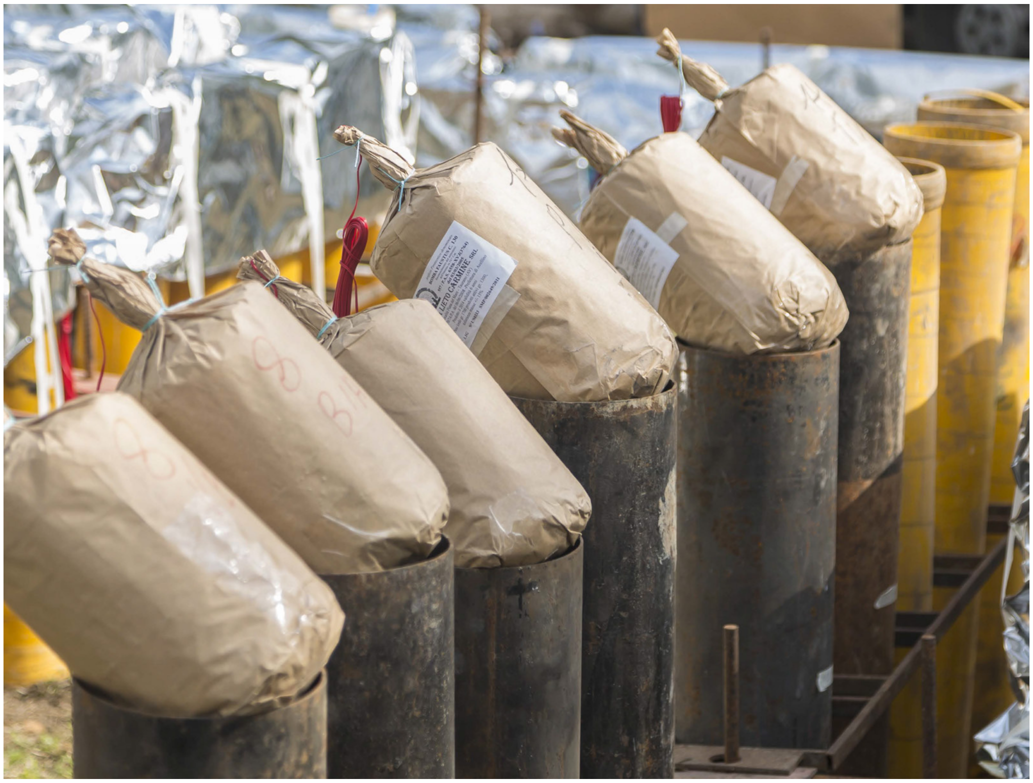
This is another one which, perhaps due to old age, is worrying me increasingly! A display crew turns up on site, lays out the mortars, racks etc, angles them as they want them for the show and secures them and then unloads all the fireworks, unpacking shells and leaving them on the tops of crates to be loaded into individual tubes.

The point is this – if shells are in tubes and there is an accidental ignition then, yes, the shell will be projected upwards as it would during the show (and there are obvious consequences of that during the rigging phase of an event). But it is unlikely that the adjacent shells will be fired – presuming they are not fused together – there is no greater likelihood of this happening during rigging than there is during the show itself. BUT if there are loose shells perched on top of adjacent tubes, open boxes of fireworks spread around, fuses exposed etc – then the chances of the fire spreading and igniting other fireworks is very very significantly increased. Not only that, but the consequences of such an ignition are increased too – unconfined shells bursting at ground level, stars being thrown at ground level to design burst diameters – into boxes of open fireworks, into vehicles, onto structures or worst of all people…

Loading shells as they come out of a box into the relevant tube is not difficult – it may take a little planning ahead but such planning is likely not only to be safer but more efficient.

Mortar rack design

Too many accidents are caused by low angle discharges of shells from mortars (usually in racks) that have fallen over from the malfunctioning of an adjacent shell. I'm not saying it is commonplace (ie the frequency is low) BUT the consequences can be very severe. One of the problems is that modern display design and firing methods removes the operator from the immediate firing area – somewhere down a relatively long piece of wire! Of course I'm not advocating hand firing over electrical firing – far from it, but it must be recognised that no sensible hand firer would light a shell in a mortar that was lying horizontally on the ground, but an electrical firing circuit (or delay fuses) could cause such a shell to be lit miliseconds, seconds or longer after the original shell failure – because the problem has not been recognised and the display not halted.



Old style racks and single mortars

A shell firing at a low trajectory will travel a long way – easily more than the design burst height and if it lands in the crowd, or bursts in or near the crowd then the consequences can be very severe indeed. It is certainly not unforeseeable that multiple fatalities could result.

The point is NOT to stop electric firing, it is to recognise what the potential risks are →

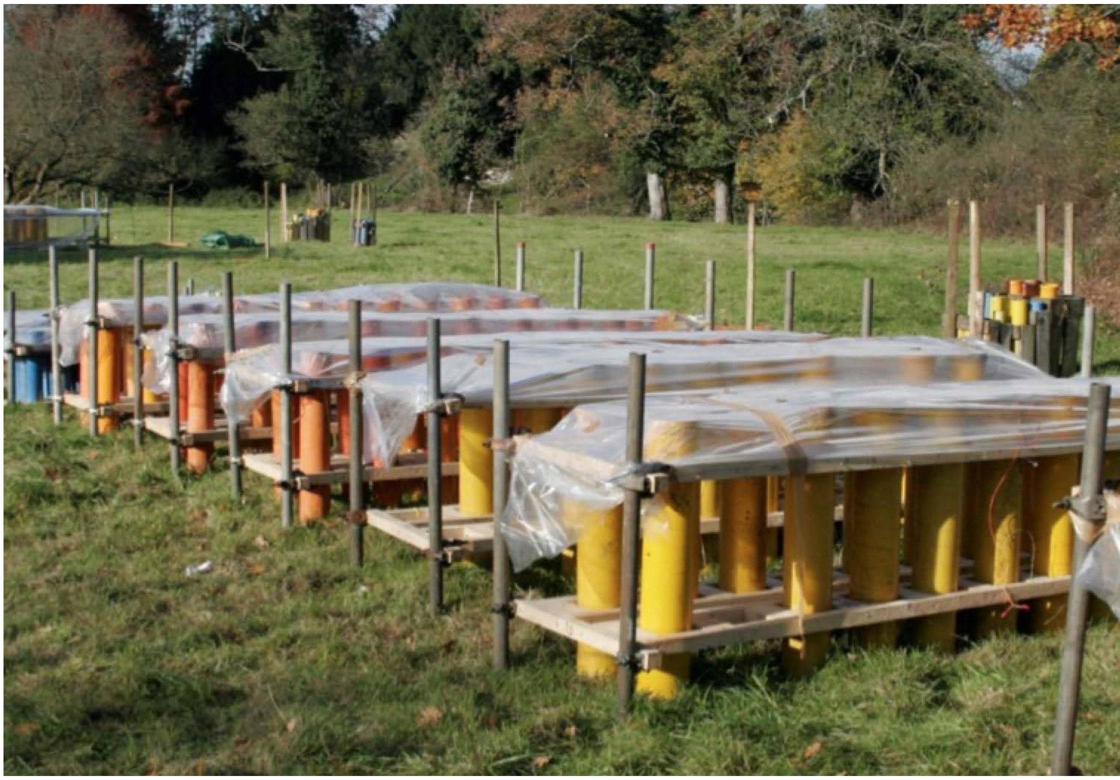
and minimise the possibility of such risks occurring (see also later to distinguish between RISK and HAZARD).

There are several ways to try and mitigate against this scenario – some are rather more tried and tested than others…

1. Build mortars that do not disrupt at all if a shell bursts prematurely within them. Actually this is quite hard to do (especially for larger calibre shells, or those with a significant flash burst) while remaining both practical and economic.
2. Build racks that mean that the failure of one mortar does not affect an adjacent mortar. This can either be by very strong rack construction (which can be impractical and even introduce additional hazards) or by separating the mortars to such an extent (and by clever rack design) so that the failure of one mortar does not affect any adjacent mortar. Studies indicate (from a variety of sources) that separating mortar tubes by their own external diameter in a rack that allows venting of gasses from a in-mortar burst (rather than confining the blast) is efficient in reducing the risk of displacement of an adjacent mortar very considerably.
3. Preventing any shell from such a displaced mortar from impacting on the crown or other areas. This can be done by putting in place "catchers" or other such devices to prevent low trajectory shells reaching the audience – but care has to be taken to ensure not only are such "catchers" going to catch all the relevant shells (the further away a "catcher" is from a mortar the higher it must be) but they are robust enough to actually do the "catching"

In all of these scenarios there is no substitute for real testing and in the case of using "catchers" modelling of shell trajectories to determine what angle shells need to be caught and hence how high and what position the catchers must be placed.

None of these solutions is cheap, but of the three probably the second is not only the most efficient, but it is the most cost effective and flexible.



Modern "ladder" rack design

The perils of Igniters

Igniters of almost any type are sensitive things! They are, by their very nature, manufactured to convert one source of energy (normally electrical) into another (heat from incandescent particles) to start an explosive train. Igniters are susceptible (like all explosives) to accidental ignition by a variety of stimuli – not just the design mode (direct current electricity).

Although the effects of Radio Frequency (RF) energy (from handheld radios and mobiles for example) on igniters is probably overstated, there is evidence that such relatively low powered RF sources can cause an igniter to function in certain, quite specific, circumstances. But high powered RF sources (such as a satellite dish on an outside broadcast unit) are much more likely to cause such an ignition – so beware/

Static electricity is a much greater risk – I have seen first-hand a bunch of igniters (thankfully not connected to anything more powerful) ignite in a person's hand as they walked across a cloth covered stage and the most likely explanation was static.

But the one feature of igniters too often ignored by users is their friction and/or impact sensitivity, especially in the presence of something relatively gritty like quickmatch or loose blackpowder. Inserting an igniter into quickmatch, or removing it from an unfired firework is probably the greatest risk – but having an igniter in the presence of something gritty and flammable like blackpowder and then crushed (for instance by dropping a shell with an igniter in the lifting charge) or stapling a fuse to a support (please don't ever do this – staple a cable tie if you have to and then use this to secure the fuse) has a very high risk of accidental ignition.

Don't be seduced into thinking a small

plastic shroud offers much protection either – in fact it can make things worse! The shroud is there primarily to add direction to the fire NOT as a way of protecting the bead.

Directional sparks from Bickford igniter with shroud in place

The best thing to do, in my opinion, is to make up small quickmatch leaders with an igniter in them – away from the display site and away from other fireworks. Protect where the bead is with a solid card or other tube – this will decrease the likelihood of an accidental ignition from impact considerably. Then use these pre-made igniters/fuses in shells, mines, candles or whatever is needed at the display site.

The point is that during their manufacture, even if an ignition were to occur, the consequences of a few igniters and short lengths of quickmatch igniting are small – whereas attaching an igniter directly to a shell, for instance, carries the SAME likelihood of ignition – but with much more severe consequences.

Don't horseplay

Don't mess around with fireworks. Fireworks are explosives, explosives have a degree of unpredictability almost inherent within them. I have seen examples of people throwing fireworks around the display site – from one operator to another – **DON'T**

I have seen people carrying around loose shells by slinging them over their shoulder like a string of onions, fuses gathered in one hand and shells neatly down their backs – think of the consequences of an accidental ignition. 100g of loose blackpowder will produce a fireball sufficient to engulf a worker – and probably have at least a 50% likelihood of fatality from the effects or burns, let alone the effects of bursts a few seconds later.

At a more basic level treat fireworks with respect. **Don't**:

- Drag boxes around
- Pile up fireworks unsafely so boxes can fall over
- Undo all the boxes immediately you arrive on site – plan things properly, expose the minimum number of fireworks at any one time that you can and
- **NEVER** smoke (oh how many times have I seen this – even people trying to be discrete – but they are always caught out)

Not only is any form of horseplay dangerous – but it presents a terrible impression to others – be they your own staff, or worse bystanders, observers or even the press.

The difference between Risk and Hazard

I know I could go on about this topic for ever (and many of those who have attended our "Risk Assessment for Firework Displays" courses probably think I already do) but the fact is that most people don't really understand the difference (including most enforcing authorities) and therefore do not understand what can be done to manage risks and hazards sensibly and bring overall risks down to acceptable levels.

In brief

A HAZARD is the intrinsic harm some operation or some firework can do to a specified set of people (eg operators or the audience) under, normally, a quite specific set of circumstances

The RISK is a measure of both the HAZARD and the of the frequency of which that HAZARD occurs

For example there is an intrinsic hazard of a 150mm shell landing within the audience area of a show and bursting on impact causing fatalities and major burns to those within some distance of the shell burst. If you are firing 150mm shells this is a HAZARD that cannot be reduced – IF the shell lands in the audience then the consequences will be the same. To reduce the RISKS from a 150mm shell landing in the audience all that can really be done is to reduce the likelihood of such a shell reaching the audience – perhaps by means outlined above, perhaps by increasing distances from firing point to audience (but reference to a modelling tool AND with an appreciation of the effects of firing angle, wind etc)

The only thing that can be done to reduce the HAZARD from a 150mm shell is to use a different shell (for example with lower burst charge etc) or more likely to use smaller calibre shells (which removes the problem of the 150mm shell completely!) This is why we all work to choose appropriate sized shells for a particular display and site – but we often do it in a somewhat arbitrary way (see the next section).

I now am firmly of the opinion that any one action to reduce risk can only EITHER have an effect on the frequency (likelihood) of the risk occurring or on the hazard if it does occur – not both. I accept that in theory at least reducing shell calibre may have an effect on both for a person standing at a large distance away from the firing point – but that is why I emphasised in the previous paragraphs the risk from a 150mm shell and not just shells in general.

Understand what hazards there are (during preparation, transport, rigging, the display and during clear up) and understand how the risks can be controlled. Make sure whatever control measures are put in place are both a) actually controlling the risk, and b) are adhered to! Again, if you have put a technique, operation or cancellation or

→

curtailment criteria in place – then make sure your display staff know about it, know why they should do it that way, and that they stick to it. If they deviate from your (your company's) way of doing things then you may have to defend that deviation in Court.

Long burning debris vs blinds

"What goes up must come down" – the problem for us is what is it that "comes down", where does it "come down" and how often does it "come down" and what that means for us in determining "Safety Distances"?

The two extremes at a display are basically these:-

1. "Normal" debris from the "normal" function of a shell – ie card pieces, burning and unburnt stars, bits of sub units etc. The "Fallout" we recognise and accept, and;
2. Abnormal debris – from shells bursting at low height, or at an undesirable (and unplanned) angle, and worst of all a "blind" shell reaching the ground and exploding on impact

The problem is that the risks from these two extremes are quite different.

	Normal functioning	**Abnormal functioning**
Frequency	Almost 100% - all shells produce debris	Very rare
Consequences	Minor to severe:- Burns to people Ignition of flammable materials Debris landing on people Debris landing in eyes	Severe:– Fatalities major burns Projectile damage Structural damage
Examples	Card from shell burst Stars reaching ground Long burning stars Unburnt stars	"Blind" shells Low trajectory shells (from displacement of mortar)
Effect of designed firing angle	Very significant, especially if down wind Shells burst at lower height, hence stars may reach ground	Significant If mortar is disrupted depends on angle and direction at point of firing
Effects of wind	Very significant, especially for angled tubes and high wind velocity	Significant, especially for angled tubes and high wind velocity
Typical frequency rating[2]	8 (almost certain)	3 (infrequent)
Typical hazard rating	4 (minor injuries)	10 (multiple fatalities)
Risk rating	32	30

It can be seen therefore that both have similar risks – but too often only "Normal" fallout is considered in determining suitable "Safety" distances and any potential control measures. Please consider ALL of the risks – sadly too many incidents have ignored the infrequent but catastrophic consequences of shell failures and have concentrated instead solely on the lower hazard aspects. Ton an extent this is human nature – don't over-emphasise the potential problems – but I can assure you that that argument does not stand up in Court.

Reloading and hand firing of shells

It is extremely rare for anything but the smallest display to have any significant element of hand firing, modern display design and a heightened appreciation of the risks to operators means that most displays are electrically fired. However don't be seduced into thinking electric firing is safer for everyone – see above.

But it is obvious that people testing new fireworks, or looking at new imported types will often hand fire them – purely for convenience. As such the risks remain and as such people must appreciate not only what could go wrong, but the proper techniques they must use to minimise the risks involved.

It's all pretty simple stuff – but I am amazed how many instances there have been of an operator getting their body over a firework at the very moment that it fires!

If you do hand fire anything ever then:-

- Use a portfire held at arm's length (I've never liked portfires on sticks)
- Position your body perpendicular to the item being lit – do if you slip and fall over it won't be towards the firework
- Don't lean in towards the firework
- Don't be tempted to return if it does not light – wait! You know what the problems are, don't do something silly just to make sure it is lit

Conclusions

Fireworks do present hazards, it is essential that these hazards are recognised and the risks involved are minimised. This paper highlights some of the issues I have seen over recent times and, I hope, might highlight them to those in the industry who are fortunate enough not to have had an accident or incident (yet).

FURTHER READING

Tom Smith "What is the safety distance for a shell?"; JPyro, Issue 29, 2010, pp12-31 or www.jpyro.com

Shellcalc© website and papers – see www.shellcalc.co.uk and www.facebook.com/shellcalc

Risk and Hazard workshops – see www.pyroworkshops.com

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[1] actually dislike the term "Safety Distance" – it implies that the distance is "Safe" ie NO RISK and far too often this is simply not the case. In most cases we are managing the risks to ensure that they are at an acceptable (but not a zero) level.

[2] Here we are working on a 0-10 weighted system for both frequency and hazard – giving a risk rating of 0-100

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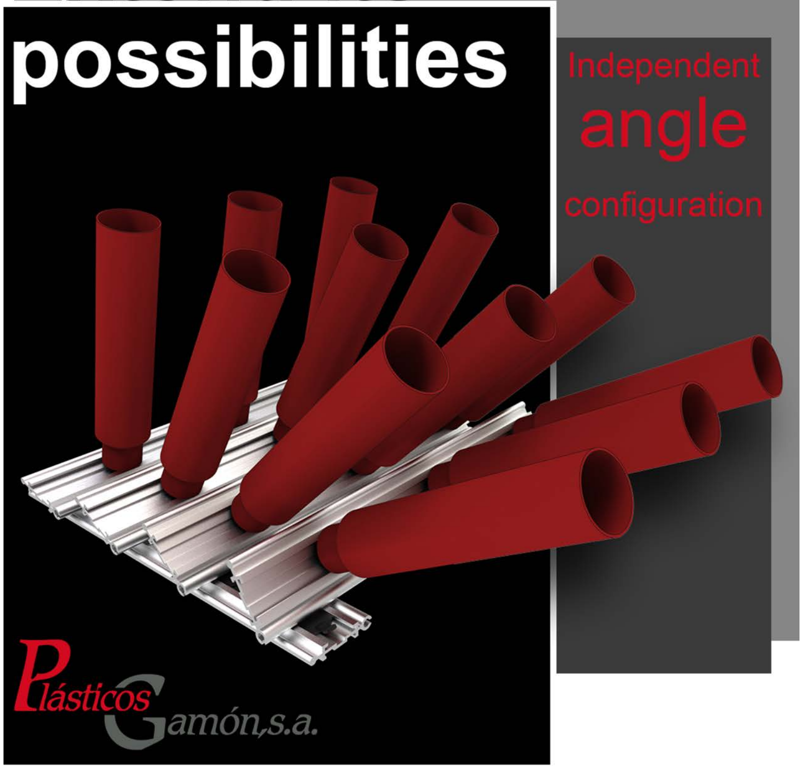

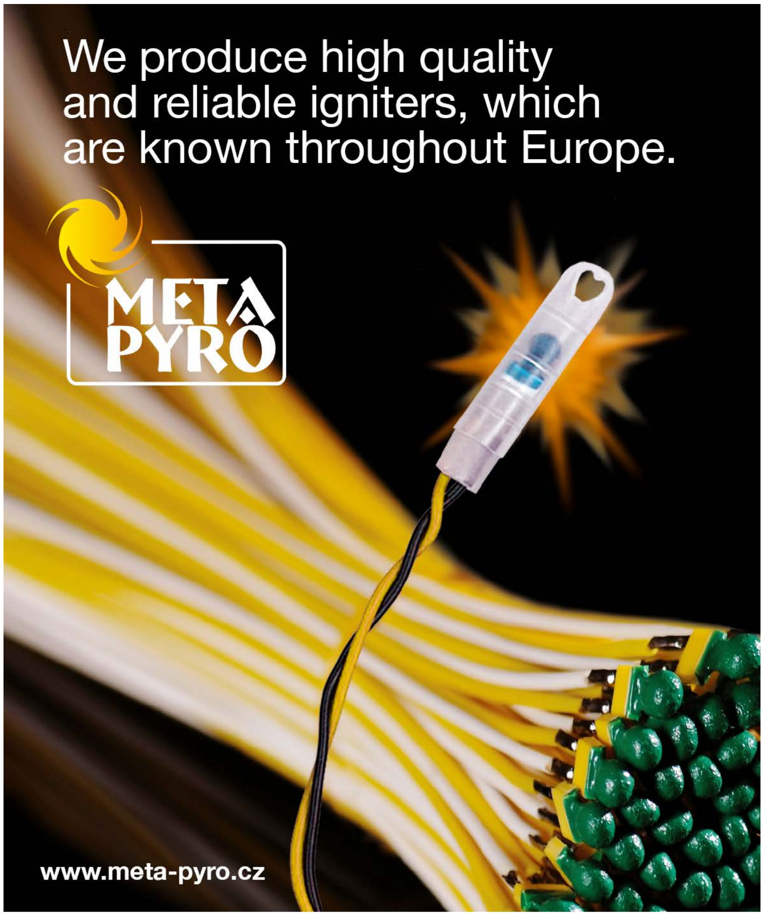

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BlackBoxx BULLETS

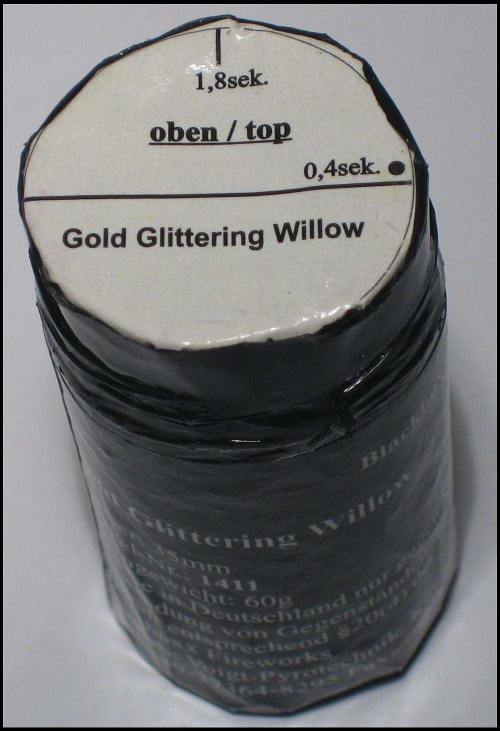
Written by Caput Mortuum Pyrotechnicum

A little more than 10 years ago I heard about a Chinese-made bombette system with an integrated, changeable delay that could be adjusted simply by turning the head of the bombette. This piqued my interest.

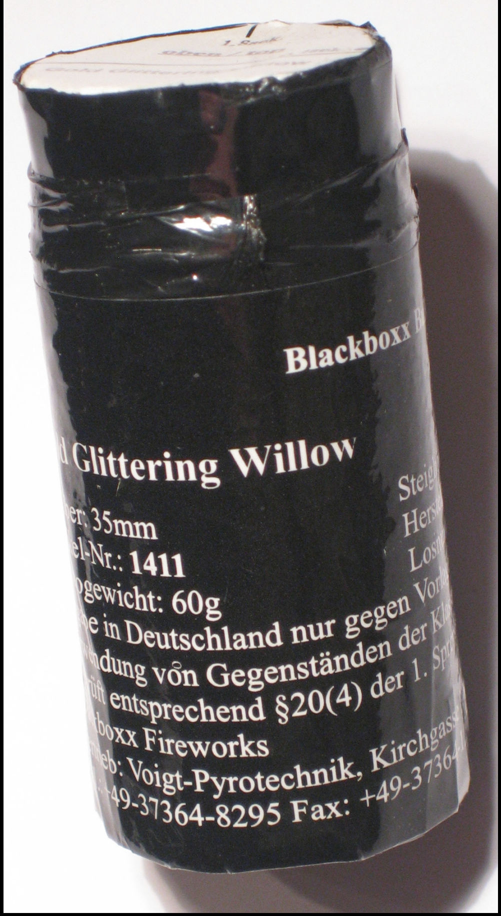
For those of you who don't know, a bombette is a small caliber cylindrical shell usually ejected from "cakes" or from candles. In Germany, Bombettes are limited to a maximum charge of 130 milligrams of flash powder in legal consumer fireworks (although obviously more flash powder is allowed for in professional grade fireworks and other countries may have differing regulations). Actually, the only system that I knew of where you could adjust a delay by turning a ring dated back to 19th century black powder artillery time fuses. Anyway, nearly 2 years passed before I got my hands on any actual samples of these bombettes. By then I had received additional information about how the system worked, too. Apparently, although a small German company called Voigt Pyrotechnik developed the idea, they were being manufactured in China. To launch these bombettes, a special mortar system was necessary. Now it became clear that it was not the breaking delay of the bombette that could be adjusted, but the launching delay between 2 bombettes. The adjustable time frame was actually very small: between 0.4 and 1.8 seconds.

The novelty of these bombettes lies in the ignition/time ring composition applied circumferentially to the surface of the cardboard tube with the use of tape match as a fire-transfer from the ignition ring to the lower lift-charge. The HDPE mortars—sold in preassembled rows—can be connected side by side with a simple "click" to assemble batteries of a limitless size. The HDPE mortar tubes are all interconnected as well. They have a small ignition transfer hole about 60mm from the bottom. The first bombette can be ignited manually using any type of fuse or igniter-cord or E-match. The fire spray of the first lift charge passes through the small hole in the side of the mortar tube, and then ignites the ignition ring of the neighboring bombette.

There have been quite a few modifications of these bombettes and mortars since this system came out more than a decade ago. The following photos will help explain the transition, function and construction of these bombettes. The most recent modification can be seen in the photo entitled "New 2015 BB BULLET."



(Above) The top of the cylindrical bombette has a round, white sticky-label pasted on it that is marked with a horizontal 0-line. The 90-degree position is also marked. This is the maximum 1.8-second delay position.


Blackboxx B
Glittering Willow
er: 35mm
el-Nr.: 1411
gewicht: 60g
e in Deutschland nur gegen Vor
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entsprechend §20(4) der 1. Sp
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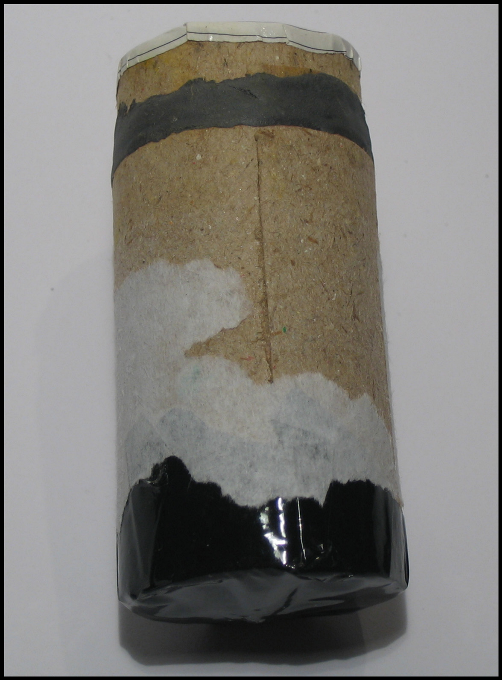
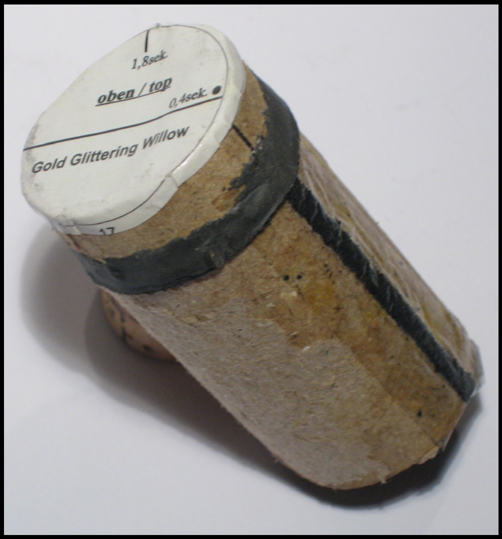
(Above) This is a side view of the complete bombette. You can see that the top portion has a slightly smaller diameter. You can also discern the band of black PE foil that covers the borderline of the larger and smaller diameter on the outside surface of the top section. This is the position where the igniter comp ring is applied. The thin black PE foil protects the timing ring from moisture and mechanical damage. The bombette has a diameter of 33mm, a height of 66mm and should be fired from mortars with a caliber of 38mm. In Germany these are classified as Category 4 "Professional Fireworks."

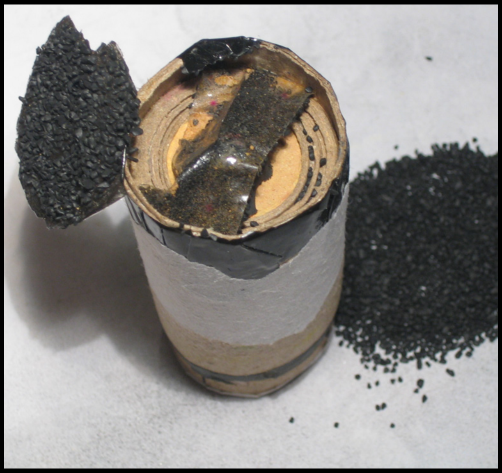
I have been told that in the United States that bombettes like these (I assume without a time ring and match tape) are sold with attached fuse cord to be used during the 4th of July celebration in sets of 12 using only one mortar tube as a reloadable. The delay of between 0.4 and 1.8 seconds can be adjusted by dropping the bombette into the mortar tube at the approximate orientation towards the fuse hole in the side of the mortar.



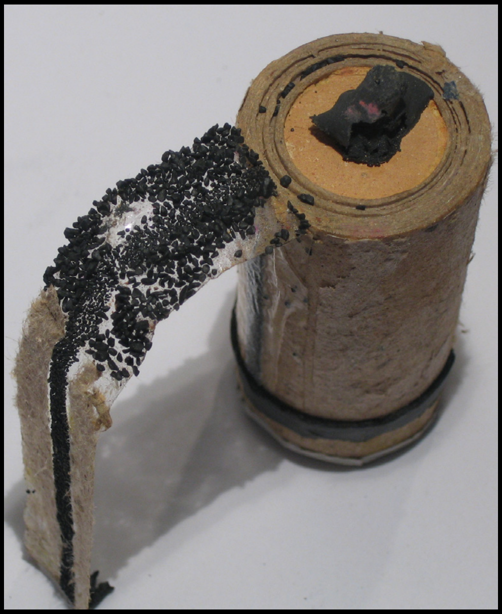
(Above) Here the outside label has been removed so you can see the gray ignition/delay composition. This composition is probably bonded with plastic because storing it underwater for a few days caused absolutely no optical/mechanical change. It did lose its ignitability completely, however.



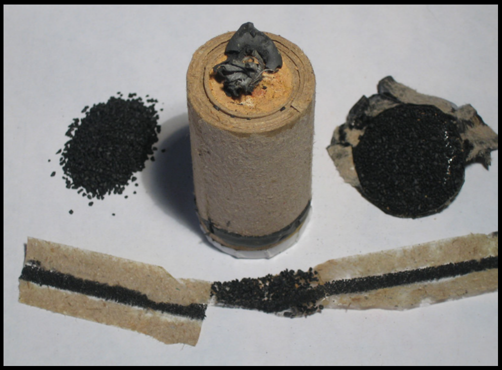
(Above) In this picture you can clearly see the match-tape that transfers the fire stimulus from the ignition/delay ring down to the lift charge and time fuse. This photo also shows one of the inherent problems with this system as well. As an extension of the match-tape, above the delay ring, there is a black pencil line mark. This marks the 0.4-second delay point. This line also helps guide the Chinese workers during product assembly as an orientation mark for pasting on the top white covering label. The middle line of the label should be directly in line with this marking. As you can see in this photo, that is not the case.



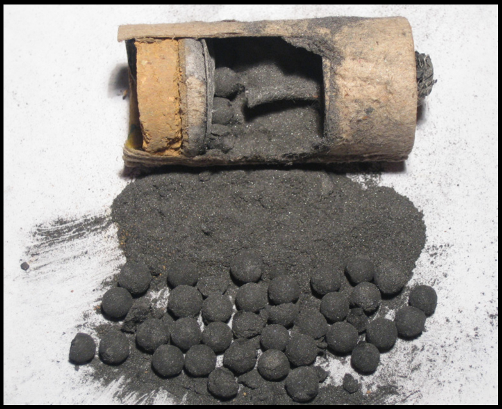
(Above) This is the bottom view of the bombette with a lift-charge of 2.5 grams of fine-grained black powder.



(Above) When the match-tape is folded back from the bottom, you can discern the Chinese time fuse in the middle of the reddish-orange clay plug. The time fuse is covered with pasted-on ignition composition.

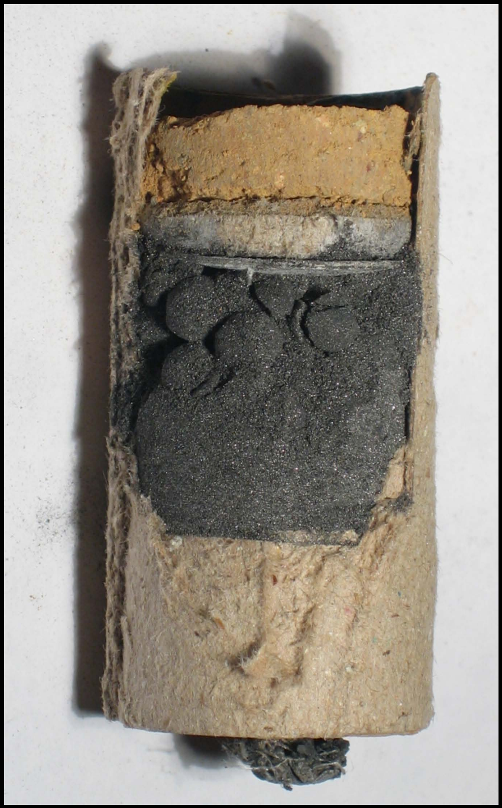


(Above) Here the end of the Chinese time fuse has been untwisted so that you can see its construction. As presented, it is made up of a few strands of traditional,gray chinese tissue-paper-fuse that are held together by some thread wound around the outside. This type of fuse is not a precise time fuse, but is mostly used for fire-transfer in batteries.



(Above) The simple Chinese fuse inside the bombette is visible in this photo as it passes through the bottom clay plug. The bombette shown in this photo is charged with 57 small, 6mm round stars that weigh all together 9 grams mixed with 4.5 grams of break-charge powder. The powder fills in all the interstices between the stars so a coherent column results.

(Next page top) In this semi-section the rammed-in plug of reddish-orange clay is visible. Below this a shock absorber has been inserted, and a paper disc covers the stars and break charge (also called a bursting charge). The clay has been rammed in manually using a traditional plunger and mallet. The percussive pressure being



exerted on the whole assembly when the plunger is hit with the mallet, forming the clay plug, also compresses the pyrotechnic charge. The shock absorber protects the stars from being damaged during this assembly step. The quite large break charge also helps protect the stars from being damaged.

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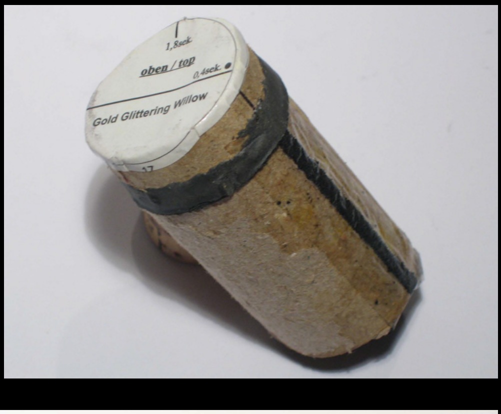
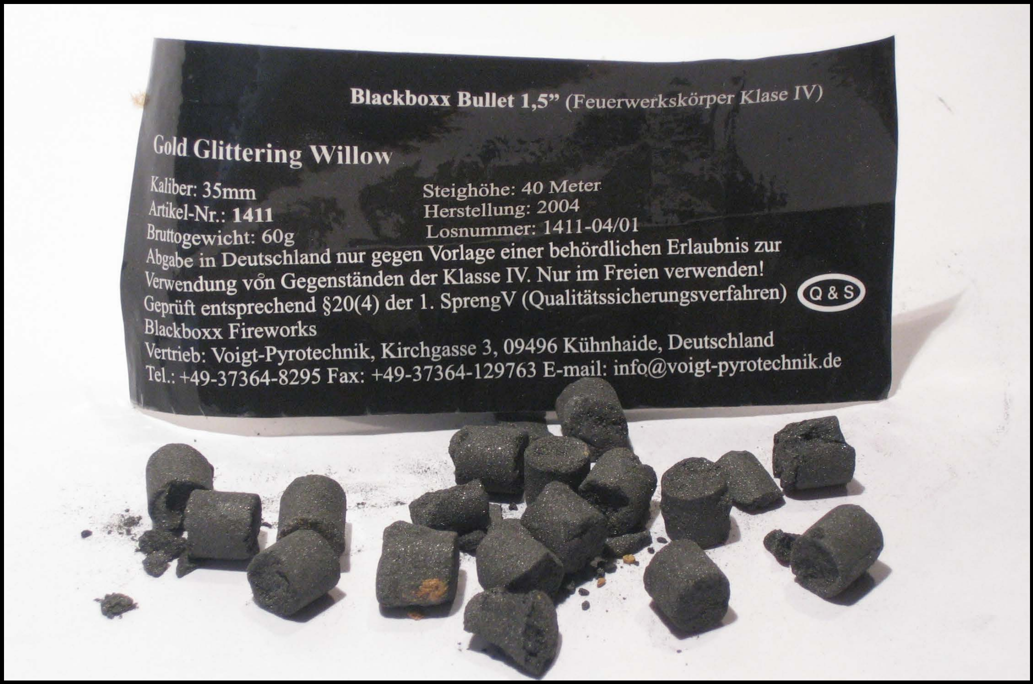
(Bottom image) This shows the "Gold Glittering Willow" stars. These are pressed stars of 8mm in diameter and a height of 10mm. Each bombette contains 19 stars weighing 9.5 grams.

(Below) Here you can clearly see the tolerances that occur because of the simple manufacturing method used. Hundreds of thousands of these bombettes are produced by hand and the workers are not given adequate time to properly align the orientation marks on the top label to the side marking properly. 90 degrees is equal to a burning delay of 1.4 seconds. A misalignment of 10 degrees reduces the delay to 1.24 seconds.





Blackboxx Bullet 1,5" (Feuerwerkskörper Klase IV)

Gold Glittering Willow

Kaliber: 35mm
Artikel-Nr.: 1411
Bruttogewicht: 60g
Steighöhe: 40 Meter
Herstellung: 2004
Losnummer: 1411-04/01

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2015 Bullet

As I mentioned, these bombettes were part of a 2004 production lot. Quite a few modifications have appeared during the intervening years. One of the problems that often occurred when using this system related to the small fire-transfer hole in the mortar tube. These holes would clog easily from burnt powder residue. I have been told this problem has since been rectified.

At a 2004 BlackBoxx product presentation of Category 2 and Category 4 products, I noticed surprisingly that both products used the same type of stars (although the stars in Category 4 were a little larger and longer burning).

Of all the effects shown, I personally prefer the Gold and Silver Glittering Willow stars the most. These were the only bombettes with a reasonably long burning time. Last December I visited a Category 2 BlackBoxx product presentation. Nearly every item presented was an improved version of Gold or Silver Glittering Willow stars with added light output. Mixed in with these stars were very small—but modern—compounded colored-effect stars that had beautiful electric/metallic colors that were exceptionally bright. When a bombette charged like this breaks, for a brief moment you see the beautiful image of its full-color effect. Simultaneously the willow stars continue to burn for a much longer duration to result in a reasonable overall burning effect duration. ■

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PART 1

VILLAFRANCASICULA & CALAMONACI 2015

Written by Tobias Brevé & Robin Harteveld

Our annual fireworks road trip began last summer on the beautiful Italian island of Sicily. Just as in the summer of 2014, we were fortunate enough to see some outstanding Sicilian displays in Calamonaci shot by La Rosa International Fireworks and ZioPiro. After a two-year absence, the committee of Villafranca Sicula decided once again to organize festivities and fireworks displays, assigned the major fireworks display to La Rosa International Fireworks. ZioPiro and Nino Belardo, Calamita Fireworks andF. Lli Toscano shot the other displays. →

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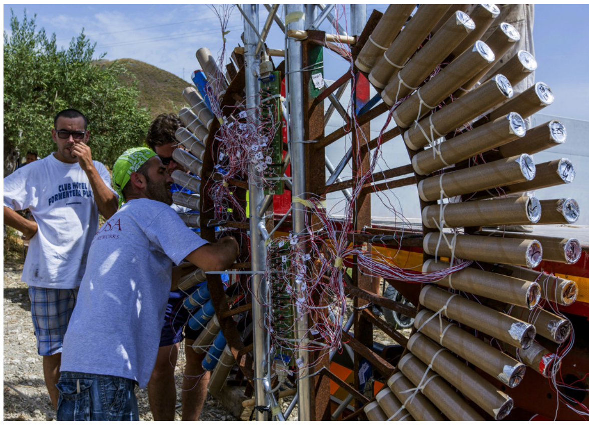
In the southern regions of Italy, including Sicily,festivals are mainly held for religious reasons and not just to attract tourists. The fireworks there are always coming led with a particular region’s heartfelt religious beliefs, and designed to add dignity and solemnity to this distinctive facet of their culture. Good examples of these types of festivals are: Festa di San Vincenzo Ferreri, which is celebrated in Calamonaci, and Festeggiamenti di Maria SS. Del Mirto, which is celebrated in Villafranca Sicula. Both festivals are held to honor the saints and this is done with a rigattiate. The rigattiate can be defined as a kind of holy war. It is a mixture of faith and folklore, religion and paganism. During these festivals,two important religious statues—San Michele, the Archangel, and San Giovanni the Baptist—are carried during a procession that meanders throughout the village. Both festivals culminate with several huge fireworks displays shot near the town itself, each one dedicated to either San Michele,Arcangelo, or to San Giovanni, Battista.

The festival held in Villafranca Sicula began July31st with a fireworks display performed by Calamita Fireworks in honor of San Giovanni. This particular show was the first one we had watched in a while and the powerful cylindrical multi-break shells used to open the show were overwhelming. That may explain why the first minute of the film is out of focus (Ha!).After the initial opening the show had a nice build up full of colorful themes and quality products. The highlights of this show were the marvelously large caliber white rain shells (@7:40 minutes on the video below).

The next day ZioPiro's and Nino Belardo's turn. Their show also honored San Giovanniand it did so aggressively. The opening of the show was spectacular with a huge number of quickly timed single shots followed by powerful cylindrical multi-break shells. Oftentimes, after a sensational opening, shows can become somewhat tempered. But this was not the case with this particular show and the tempo and energy remained high throughout. Even the finale was incredibly colorful and ended with a precisely timed single shot sequence and a massive golden shower!

On August 2nd, the final day of the festivities, La Rosa International Fireworks shot a huge show in honor of San Michele. Prior to that, a kind of appetizer so to speak, was organized by the central committee and shot by F.lli Toscano in preparation of the for the grande finale.

During the day we visited the immense set-up of the final show, which consisted of seven individual launching positions spread over a 150-meter-wide olivefield. Added to this already spectacular set-up was a special element called the tower of light. This tower was well over 30 meters tall with two 20-meter-high platforms built to position additional racks of single shots.



La Rosa Fireworks’ regular crew teamed up with several members of the San Michele Association in Villafranca Sicula and designed the setup for the tower of light.

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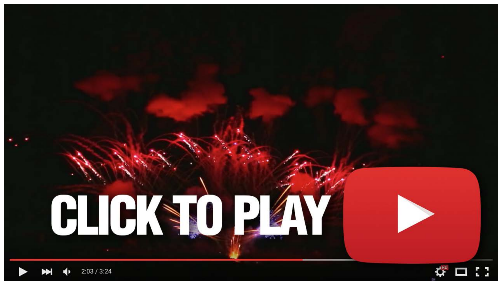
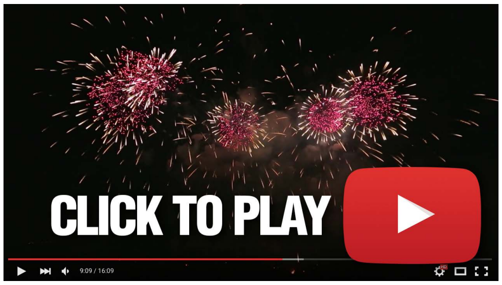
MEN OF THE TOWER OF LIGHT

These men are widely known as the "Men Of The Tower Of Light" (above) in Villafranca Sicula and throughout the surrounding area.

La Rosa's crew kept itself busy loading multi-break shells, positioning candles and connecting uncountable e-matches, as the San Michele team started installing single shot racks on individual segments of the tower. First, they installed the top-segment that contained a 360° wheel full of single shots. Next, a crane lifted the next segment, comprised of single shots attached one beneath the other. Note: this is a challenging task for the San Michele team and ultimately the complete team has to work very hard to completely installand prepare the tower of light. All this hard work doesn't make them unfriendly, however. They gave us full access and allowed us to film and photograph every aspect of their setup. And you can watch all of this unfold in our exclusive Behind the Scenes & Highlights movie:



The show was supposed to begin at mezzanotte (Italian for midnight), but that would be very un-Italian to actually start a show at the planned time. No matter, that gave us time to meet and chat with some of the locals there. About an hour and a half late the first salute was fired and the actual show finally began! There was immediate intensity with a great many cylindrical multi-break shells fired in rapid succession interspersed with artistic single shot sequences combined with ground shots coming from the tower of light. The 16-minute long display was memorable and showed everyone how mind-blowingly perfect a professional Italian display can be.



After a few "pyro-days off" our adrenaline calmed somewhat and reached a relatively normal level again. Not for long, however, as the festivities in Calamonaci began once again on the 9th of August! Excitement reigned as we entered the shooting area once again, and just like Villafranca La Rosa International Fireworks,their setup consisted of seven positions.This time La Rosa would shoot the display to honor San Giovanni and ZioPiro would honor San Michele. As some Italian friends told us, ZioPiro wanted to open the display with a staggering 1200 shot sequence shot in less than 20 seconds! This was to be followed by large cylindrical shells and round shells (up to 16 inches in

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diameter). So, we sought this setup out because it was something we wanted to see.

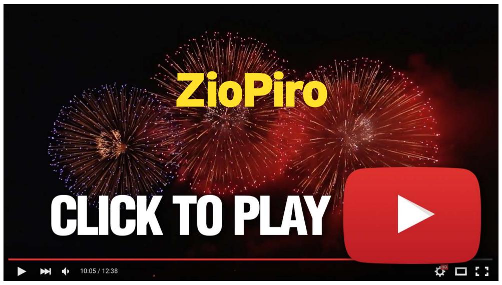
Besides the huge number of single shots, the show was richly filled with Italian-made cylindrical and spherical shells. The team of ZioPiro was also very friendly and they allowed us a unique opportunity to film yet another Behind the Scenes movie that should help everyone better understand the size and scope of this type of show and the outstanding Italian pyro skills necessary to pull it off.

As evening came, we rested briefly because if this was anything like last year the show might start as late as 4:00 in the morning! So, we planned for this and arrived around midnight in the center of the Calamonaci where the rigattiate was supposed to begin. The first show was created to honor San Michele, and the second, San Giovani, and both were celebrated with beautiful music, great passion and noise. After several hours of this revelry, the saints returned to the center of the village and the citizens gathered in the olive field just outside of town to enjoy a massive fireworks display. Following the crowd, we positioned our tripods and cameras in the best possible spot for viewing the spectacle.

The honor of shooting the first show went to La Rosa. It was well timed and colorful. Unfortunately, the wind died and La Rosa's show became partially obscured by the smoke. Even so, the show was a great success (see the "sette per sette" sequence @1:47. "Sette per sette is a sequence of 49 large cylindrical shells shot from 7 positions of 7 shells each). After the break of the 7th cylindrical shell, the inserts of the first cylindrical shell will explode all together.

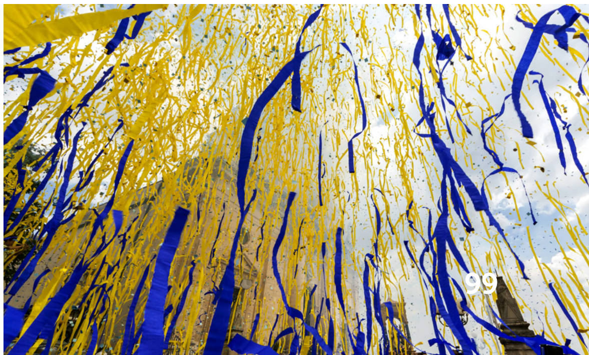
Another point in the show worth mentioning occurs @8:25 during the video when the huge ghost shells go off.

When it was ZioPiro's turn to start their display, a little breeze had come up and cleared away most of the smoke from the previous show. As we mentioned earlier, their plan was to set off 1200 single shots to open their show! Wow! Absolutely fabulous! Not only was it visually astounding, but the ardent rhythm of detonations was felt intensely by everyone. After their opening, several thematic sections were shot (our favorite theme occurs @3:55. When you watch it you'll see beautiful gold and green cylindrical shells supported by matching candles). The most breathtaking moment of the show (in our opinion, of course) occurred at the end with a gigantic salvo of white rain shells several hundred meters wide.



The festivities in Villafranca Sicula and Calamonaci were a unique experience we thoroughly enjoyed. We were able to see some exceptional displays choreographed passionately by pyrotechnic professionals at their best. We would sincerely like to thank La Rosa International Fireworks, ZioPiro and the San Michele Association in Villafranca Sicula for their hospitality and for providing us with an unforgettable experience.

In the next issue: Sicily & Pyro Part 2 where we continue our Sicilian trip and share the wonderful imagery of shooting huge daylight confetti displays! ■



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